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NATIONAL DAM INSPECTION PROGRAM. PINETREE LAKE DAM NDI ID NUMBE--ETC(U)
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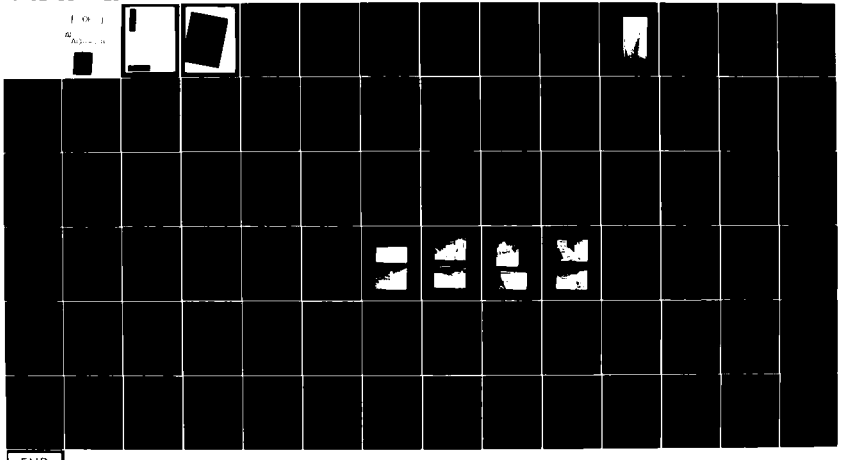

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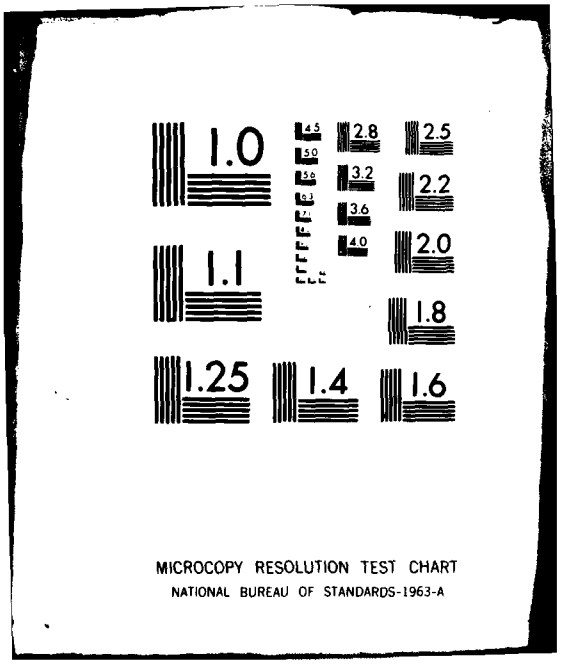
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GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Harrisburg, PA
DACW-31-80-C-0017

DELAWARE RIVER BASIN,
DRY SAWMILL RUN, MONROE COUNTY,
PENNSYLVANIA.

(1)

(6) NATIONAL DAM INSPECTION PROGRAM.

PINETREE LAKE DAM
NDI ID NUMBER PA-00784,
DER ID NUMBER 45-244,

(12) 84

UNIDEL, INC.

PHASE I INSPECTION REPORT.
~~NATIONAL DAM INSPECTION PROGRAM.~~

Prepared by

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
P.O. Box 1963
Harrisburg, Pennsylvania 17105

For (15) DACW31-80-C-0017

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

(11) APR 80

411004

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

DELAWARE RIVER BASIN

DRY SAWMILL RUN, MONROE COUNTY

PENNSYLVANIA

PINETREE LAKE DAM

NDI ID No. PA-00784
DER ID No. 45-244

UNIDEL, INC.

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

APRIL 1980

CONTENTS

APPENDICES

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam:	Pinetree Lake NDI ID No. PA-00784 DER ID No. 45-244
Size:	Small (25 feet high; 355 acre-ft)
Hazard Classification:	Significant
Owner:	Unidel, Inc. P.O. Box 14 Pocono Summit, PA 18346 Address Correspondence To: Mr. James Rabold Corresponding Agent 621 North Courtland Street East Stroudsburg, PA 18301
State Located:	Pennsylvania
County Located:	Monroe
Stream:	Dry Sawmill Run
Date of Inspection:	14 November 1979

Based on visual inspection, available records, calculations, and past operational performance, Pinetree Lake Dam is judged to be in good condition. The recommended Spillway Design Flood (SDF) for the size and the hazard classification of the dam varies between the 100-year flood and the 1/2 Probable Maximum Flood (PMF). Based on the criteria and the downstream conditions, the SDF is the 1/2 PMF. The spillway will pass the PMF with 0.5 foot of freeboard. The spillway capacity is rated as adequate.

next page

No stability problems were evident for the embankment. None of the observed deficiencies at the dam were considered an immediate hazard.

The following remedial measures are recommended to be undertaken by the Owner, in approximate order of priority, without delay:

(1) Repair the undermining of the left wingwall at the stilling basin and provide erosion protection at the area.

(2) Monitor the cracks in the walls of the spillway chute. If more cracks appear, or if enlargement of existing cracks is noted, have the condition evaluated by a professional engineer experienced in the design and construction of dams.

(3) As part of the existing maintenance program, remove reinforcing bars lying in the outlet works pipe, and establish an adequate grass cover at the bare areas on the downstream slope.

In addition, the Owner should institute the following operational and maintenance procedures:

(1) Develop a detailed emergency operation and warning system for Pinetree Lake Dam.

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of Pinetree Lake Dam. Have sufficient personnel available to remove any debris that may collect at the spillway bridge.

(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system.

(4) As presently required by the Commonwealth, institute a program of formal annual inspections by a professional engineer experienced in the design and construction of dams. Utilize the inspection results to determine if remedial measures are necessary.

(5) Inspect the embankment after every flood to determine if erosion has occurred on the upstream slope. Take appropriate action as necessary.

PINETREE LAKE DAM

Submitted by:

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.

FREDERICK FUTCHKO
Project Manager, Dam Section

Date: 2 May 1980

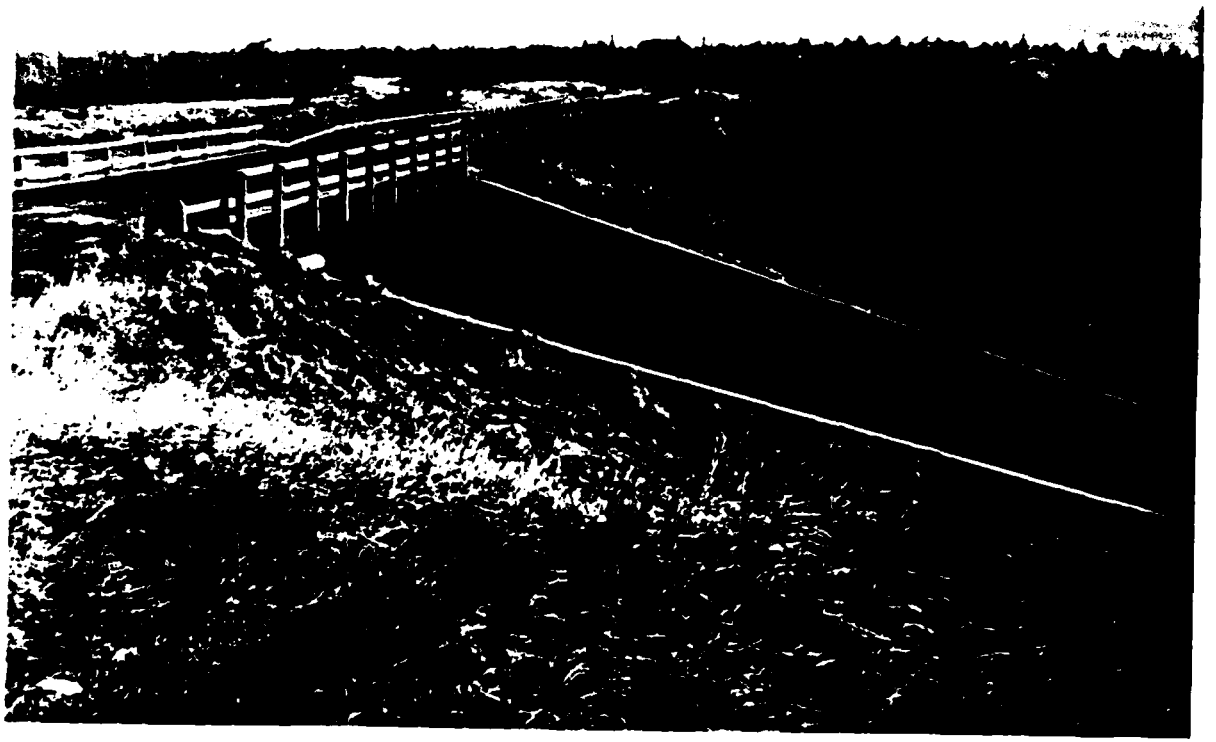
Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 16 May 1980

PINETREE LAKE DAM



Overview

DELAWARE RIVER BASIN

DRY SAWMILL RUN, MONROE COUNTY

PENNSYLVANIA

PINETREE LAKE DAM

NDI ID No. PA-00784
DER ID No. 45-244

UNIDEL, INC.

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

APRIL 1980

SECTION 1

PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Pinetree Lake Dam is a homogeneous earthfill embankment with a filter blanket and toe drain. The embankment is 25 feet high at its maximum section and 510 feet long. The top of the dam serves as an access road.

The spillway is located at the right abutment of the dam. It is a concrete chute with a control section at the upstream end. The control section is 54 feet wide and 7 feet below the design top elevation of the dam. The sidewalls at the control section also act as bridge abutments to support the steel beams of the timber deck spillway bridge. A stilling basin is at the downstream end of the chute.

The outlet works is located near the middle of the dam. It consists of an 18-inch diameter corrugated metal pipe with concrete intake and outlet structures. A sluice gate is at the upstream end. The gate operating mechanism extends along the upstream slope to just above normal pool level. The various features of the dam are shown on the Photographs in Appendix C and on the Plates in Appendix E. A description of the geology is included in Appendix F.

b. Location. Pinetree Lake Dam is located on Dry Sawmill Run in Monroe County, Pennsylvania, approximately 2.6 miles southwest of Pocono Summit. The dam is on the boundary line between Tobyhanna and Tunkhannock Townships. Pinetree Lake Dam is shown on the 1973 photorevision to USGS Quadrangle, Pocono Pines, Pennsylvania, at latitude N 41° 04' 50" and longitude W 75° 24' 25". A location map is shown on Plate E-1.

c. Size Classification. Small (25 feet high, 355 acre-feet).

d. Hazard Classification. Significant hazard. Downstream conditions indicate that a significant hazard classification is warranted for Pinetree Lake Dam (Paragraphs 3.1e and 5.1c (5)).

e. Ownership. Unidel, Inc., P.O. Box 14, Pocono Summit, Pennsylvania 18346. Address correspondence to: Mr. James Rabold, Corresponding Agent, 621 North Courtland Street, East Stroudsburg, PA 18301.

f. Purpose of Dam. Recreation.

g. Design and Construction History. Pinetree Lake Dam is part of the Emerald Lakes Development. The dam was originally named Emerald Lakes Dam. It was designed in 1970 by Fogarasi and Moyer, Consulting Engineers, Allentown, Pennsylvania. The Commonwealth reviewed the design and suggested revisions. The revisions were incorporated in the design and permit for construction was issued in June 1971. Construction of the project started in May 1972 under the supervision of the design engineers. The contractor was Bonham's General Contracting of Honesdale, Pennsylvania. The dam was completed in October 1972. Mr. John C. Parisi was project engineer throughout design and construction.

The spillway bridge collapsed in June 1973. An inspector from the Commonwealth felt the failure was caused by restraint problems. No plans are available for the original bridge, which was not part of the original dam design.

The bridge was replaced at an unknown date. The Emerald Lakes Association, which is the local property owners' organization, believed the new bridge was designed by Mr. Robert Kaelin. Other than this, there are no data concerning the new structure.

Maintenance and security for the dam are provided by the Emerald Lakes Association, under written agreement with the Owner. At present, the Owner is in voluntary bankruptcy. Mr. James Rabold, a past president of Unidel, felt that the reorganization of Unidel would be successfully accomplished in the near future.

h. Normal Operational Procedure. The pool is maintained at the spillway crest level with excess inflow discharging over the spillway. The outlet works is not normally used. Spillway discharge flows downstream in Dry Sawmill Run to the confluence with Pocono Creek, which is about 3.7 miles downstream.

1.3 Pertinent Data.

a.	Drainage Area. (square miles)	1.5
b.	Discharge at Damsite. (cfs.)	
	Maximum known flood at damsite	Unknown.
	Outlet works at maximum pool elevation	20
	Spillway capacity at maximum pool elevation	3,100
c.	Elevation. (feet above msl.)	
	Top of dam	1875.0
	Maximum Pool	1875.0
	Normal pool (spillway crest)	1868.0
	Upstream invert outlet works	1856.5
	Downstream invert outlet works	1852.0
	Streambed at toe of embankment	1850.0
d.	Reservoir Length. (miles)	
	Normal pool	0.36
	Maximum pool	0.44
e.	Storage. (acre-feet)	
	Normal pool	128
	Maximum pool	355
f.	Reservoir Surface. (acres)	
	Normal pool	20
	Maximum pool	47
g.	Dam.	
	Type	Homogeneous earthfill with blanket drain.
	Length (feet)	510
	Height (feet)	25
	Topwidth (feet)	
	Design	30
	Existing	26

g.	Dam. (cont'd.)	
	Sides Slopes	
	Design	
	Upstream	1V on 3H
	Downstream	1V on 2H
	Existing Conditions	
	Upstream	1V on 2.8H
	Downstream	1V on 2.4H
	Zoning	Filter blanket and toe drain.
	Cut-off	Inspection trench back-filled with embankment earthfill.
	Grout Curtain	None.
h.	Diversion and Regulating Tunnel.	None.
i.	Spillway.	
	Type	Concrete chute.
	Length of Weir (feet)	54.0
	Crest Elevation	1868.0
	Upstream Channel	Reservoir, vertical concrete walls.
	Downstream Channel	Concrete chute.
j.	Regulating Outlets.	
	Type	One 18-inch diameter corrugated metal pipe.
	Length (feet)	148

j. Regulating Outlets. (cont'd.)

Closure	Sluice gate at intake structure.
Access	Operating mechanism on embankment slope.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Data Available. Design data available for review included the following: approved design drawings, foundation data, a permit application report, a design report, and computations for spillway hydraulics.

b. Design Features. The project is described in Paragraph 1.2a. The various features of the dam are shown on the Photographs in Appendix C and on Plates E-2 to E-5 in Appendix E. The embankment is shown on Photographs A through C. The spillway is shown on Photographs F and G. The outlet works is shown on Photographs D and E.

c. Design Considerations. Nothing was noted in the review of the design data that would cause concern.

2.2 Construction.

a. Data Available. Construction data available for review included construction progress reports, soil test data, and construction photographs.

b. Construction Considerations. The design engineer, who also supervised construction, reported that no unusual problems were encountered during construction. Available soil test data indicate that the specified in-place density requirements were met.

2.3 Operation. There are no formal records of operation. There is no record of any inspection of the dam since its completion. The only post-construction data concern the failure of the spillway bridge in 1973. These data are very limited.

2.4 Evaluation.

a. Availability. Engineering data were provided by the Bureau of Dams and Waterway Management, Department of Environmental Resources, Commonwealth of Pennsylvania (PennDER). The Emerald Lakes Association made available the maintenance supervisor for information during the visual inspection. The design engineer researched his files for information at the request of the inspection team.

b. Adequacy. The type and amount of available design data and other engineering data are limited; and the assessment must be based on the combination of available data, visual inspection, performance history, hydrologic assumptions, and hydraulic assumptions.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3

VISUAL INSPECTION

3.1 Findings.

a. General. The overall appearance of the dam is good. Some deficiencies were observed as noted below. A sketch of the dam with the locations of deficiencies is presented on Exhibit B-1 in Appendix B. Survey information acquired for this Report is summarized in Appendix B. On the day of the inspection, the pool was 0.2 foot above spillway crest.

b. Embankment. The embankment is in good condition. The only deficiencies on the downstream slope are a few small bare areas. No erosion of the areas is evident. The riprap on the upstream slope is in good condition, but it is poorly graded in some areas. Just to the left of the spillway, the riprap is no larger than cobbles (Photograph C).

Water was flowing along the toe of the embankment (Photograph A). It appeared that most of the water was surface runoff, caused by rains on the previous day. Some of the water originated at the outfalls of the embankment blanket drain. It was estimated that the left outfall was trickling at 0.25 gpm. The amount of water trickling at the right outfall was too small to estimate. The total flow along the toe of the dam was estimated at 5 to 10 gpm.

The survey performed for this inspection reveals that the top of the embankment is above the design elevation. The typical section surveyed for this inspection reveals that there are minor differences between the design embankment section and the existing section. These differences are shown on the section in Appendix B.

c. Appurtenant Structures. The spillway is in good condition. No deficiencies were observed at the concrete slabs, timber bridge deck, or steel bridge beams. The walls of the chute have some small vertical cracks. However, an opening of 1/8 inch was measured at one crack

just upstream of the spillway bridge. There is leaching at one crack. The weep holes in the walls under the bridge are trickling. At the downstream end of the stilling basin, the left wingwall is undermined by 2 feet along most of its toe.

The outlet works is in good condition. The maintenance supervisor for the Emerald Lakes Association stated that the gate was operated annually and had been operated 3 weeks prior to the inspection without any problems. Because the gate was recently operated, the inspection team did not request that it be operated. Two reinforcing bars are lying on the bottom of the outlet works pipe and are protruding from the outfall. The pipe at the outfall is rusty, with some scaling noted (Photograph E).

d. Reservoir Area. The watershed has mild slopes. It is mostly covered with scrub brush. There are quite a few homes of the Emerald Lakes Development within the watershed. Also within the watershed are the Emerald Lakes, which are named Ramot Lakes on USGS mapping (Photograph G). The lakes are separated by a highway bridge. Data obtained for the Emerald Lakes during the visual inspection are in Appendix B.

e. Downstream Channel. The valley downstream from the dam is relatively flat. There is one dwelling about 200 feet downstream from the dam that would be flooded by a failure of the dam. About 0.7 mile downstream from the dam, Dry Sawmill Run flows through a 16-foot wide, 12-foot high horseshoe culvert that extends beneath the Interstate-380 (I-380) embankment, which is about 25 feet high. Downstream of I-380 there are no structures immediately adjacent to the stream for at least 1 mile.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedure. The reservoir is maintained at the spillway crest level with excess inflow discharging over the spillway and into the downstream channel. The outlet works is normally not used.

4.2 Maintenance of Dam. The Emerald Lakes Association is responsible for the security and maintenance of the dam. The maintenance supervisor visits the dam daily and accomplishes minor maintenance, such as mowing of the grass, on an as-needed basis. Major maintenance items require approval of the Emerald Lakes Association Board of Directors. Formal inspections of the dam are not made.

4.3 Maintenance of Operating Facilities. The outlet works is operated annually. Maintenance of the outlet works is performed as needed.

4.4 Warning Systems in Effect. The maintenance supervisor stated that he was not aware of any emergency operation and warning system.

4.5 Evaluation of Operational Adequacy. The maintenance of the dam is generally good. Formal inspections are necessary to detect hazardous conditions at the dam. An emergency operation and warning system is necessary to reduce the risk of dam failure should adverse conditions develop and to prevent loss of life should the dam fail.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The design report prepared by the design engineer indicates that the spillway was designed to pass the Curve "C" discharge of 2,057 cfs that was required by the Commonwealth. The designer used a head of 5 feet and a discharge coefficient of 3.4. The design discharge coefficient appears to be slightly high; a coefficient of 3.1 is used in the analysis described hereafter. This analysis also uses the full available head of 7 feet.

b. Experience Data. No records of maximum pool levels were available.

c. Visual Observations.

(1) General. The visual inspection of Pinetree Lake Dam, which is described in Section 3, resulted in a number of observations relevant to hydrology and hydraulics. These observations are evaluated herein for the various features.

(2) Embankment. The riprap on the upstream slope is evaluated in Section 6.

(3) Appurtenant Structures. The underside of the spillway bridge is at the design top of dam elevation. The bridge has the potential to collect debris during floods. This would reduce the discharge capacity. No reduction on account of this has been included in the analysis described hereafter.

The reinforcing bars in the outlet works pipe have the potential for trapping debris, which would reduce the discharge capacity of the pipe. This is only of minor concern because the reduction would be small. The sluice gate at the upstream end of the outlet works provides an upstream closure facility.

(4) Reservoir Area. The bridge between the two Emerald Lakes is sufficiently wide that it would not significantly affect the hydraulics. Thus, the two lakes will act as one. The lakes are natural impoundments, with a small control structure at the outlet (Photograph H).

Major floods would obviously overtop this structure. Although some erosion might occur near this structure, it is not felt that the erosion would significantly increase the discharge. Therefore, the only effect of the lakes on Pinetree Lake Dam will be the surcharge storage which they provide. Although the number of dwellings in the watershed of Pinetree Lake is significant, it is not felt that the development would have a significant effect on the hydrology.

(5) Downstream Conditions. No conditions were observed downstream from the dam that would reduce the hydraulic capacity of the spillway. Failure of Pinetree Lake Dam would flood only one dwelling. A backwater condition would also be created upstream of the I-380 highway embankment. No dwellings were observed within the estimated limits of the backwater flooding; however, the limits are very difficult to estimate accurately during visual inspection. Because only one dwelling downstream would be flooded by a failure of the dam, a significant hazard classification is warranted for Pinetree Lake Dam.

d. Overtopping Potential.

(1) Spillway Design Flood. According to the criteria established by the Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) for the size (Small) and hazard potential (Significant) of Pinetree Lake Dam is between the 100-year flood and one-half of the Probable Maximum Flood (PMF). Because of the downstream conditions with the resultant potential for loss of life, the 1/2 PMF is selected as the SDF for Pinetree Lake Dam. The watershed was modeled with the HEC-1DB computer program. A description of the model is included in Appendix D. The hydrologic and hydraulic analyses are based on existing conditions, and the effects of future development are not considered.

(2) Summary of Results. Pertinent results are tabulated at the end of Appendix D. The analysis reveals that Pinetree Lake Dam can pass the PMF with 0.5 foot of freeboard. The dam is rated at its design top elevation. As part of this study, it was also found that the outlet of the Emerald Lakes, located upstream from Pinetree Lake Dam, will be overtopped by 1.8 feet during the PMF.

(3) Spillway Adequacy. The criteria used to rate the spillway adequacy of a dam are described in Appendix D. Because the dam can pass the PMF, which is twice the SDF, the spillway capacity is rated as adequate.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations.

(1) General. The visual inspection of Pinetree Lake Dam, which is described in Section 3, resulted in a number of observations relevant to structural stability. These observations are evaluated herein for the various features.

(2) Embankment. The bare areas on the downstream slope are only of minor concern because they are small and no erosion has occurred. Establishing an adequate grass cover would remove any potential for erosion.

Even though the riprap on the upstream slope is poorly graded, there is no evidence of erosion; the riprap is apparently capable of resisting erosion due to wave action. However, the area adjacent to the spillway will be subject to relatively high velocity flows during a flood. It is probable that erosion would occur in this area because the riprap is poorly graded. However, it is not felt that the erosion would cause a failure of the dam if needed repairs were made immediately after each flood.

The minor variations between the design embankment section and the existing section are not significant and are of no concern.

(3) Appurtenant Structures. The cracks in the spillway chute walls were probably caused by differential settlement. They have the potential to start spalling, and they prevent the wall from acting as an impervious barrier. The condition is not of major concern at present. Both the flow from the weep holes and the leaching are not excessive and are of no concern at present. Although the undermining of the stilling basin wingwall is serious, collapse of the wall would not be a hazard to the embankment because the wall is 140 feet from the embankment. Its collapse might cause damage to the stilling basin.

The only structural problem at the outlet works is the rusty corrugated metal pipe. Since the pipe is encased in concrete, continued rusting would not be a hazard to the dam.

b. Design and Construction Data. The design engineer stated that a formal stability analysis for the embankment was not performed. No evidence of stability problems was noted in the records or during the visual inspection.

No plans for the existing spillway bridge are available. Signs are posted at each end of the bridge with the notation "absolutely no trucks." No load limit is posted. The section on Plate E-5 indicates that the bridge abutment is quite thin. It is uncertain that this section was intended to be a bridge abutment. As the existing structure was constructed about 6 years ago and no apparent problems have developed, it is assumed that the bridge is structurally adequate to carry light vehicular loads.

c. Operating Records. There are no formal records of operation. According to available data, no stability problems have occurred over the operational history of the dam.

d. Post-construction Changes. There have been no post-construction changes to the dam. The replacement of the spillway bridge is assessed above.

e. Seismic Stability. Pinetree Lake Dam is located in Seismic Zone 1. Earthquake loadings are not considered to be significant for small dams located in Zone 1 when there are no readily apparent stability problems. As there are no readily apparent stability problems, the ability of the dam to withstand an earthquake is assumed to be adequate.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety.

(1) Based on available records, visual inspection, calculations, and past operational performance, Pinetree Lake Dam is judged to be in good condition. The recommended Spillway Design Flood (SDF) for the size and the hazard classification of the dam varies between the 100-year flood and the 1/2 PMF. Based on the criteria and the downstream conditions, the SDF is the 1/2 PMF. The spillway will pass the PMF, with 0.5 foot of freeboard. The spillway capacity is rated as adequate.

(2) No stability problems were evident for the embankment.

(3) A summary of the features and observed deficiencies is listed below:

Feature and Location	Observed Deficiency
Embankment:	Poorly graded riprap on upstream slope; bare areas on downstream slope.
Spillway:	Small cracks in walls; wingwall at stilling basin undermined.
Outlet Works:	Reinforcing bars at outfall.

b. Adequacy of Information. The information available is such that an assessment of the condition of the dam can be inferred from the combination of visual inspection, past performance, and computations performed prior to and as part of this study.

c. Urgency. The recommendations in Paragraph 7.2 should be implemented without delay.

d. Necessity for Further Investigations. Accomplishment of the remedial measures outlined in Paragraph 7.2 will not require further investigations by the Owner.

7.2 Recommendations and Remedial Measures.

a. The following studies and remedial measures are recommended to be undertaken by the Owner, in approximate order of priority, without delay:

(1) Repair the undermining of the left wingwall at the stilling basin and provide erosion protection at the area.

(2) Monitor the cracks in the walls of the spillway chute. If more cracks appear, or if enlargement of existing cracks is noted, have the condition evaluated by a professional engineer experienced in the design and construction of dams.

(3) As part of the existing maintenance program, remove reinforcing bars lying in the outlet works pipe, and establish an adequate grass cover at the bare areas on the downstream slope.

b. In addition, the Owner should institute the following operational and maintenance procedures:

(1) Develop a detailed emergency operation and warning system for Pinetree Lake Dam.

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of Pinetree Lake Dam. Have sufficient personnel available to remove any debris that may collect at the spillway bridge.

(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system.

(4) As presently required by the Commonwealth, institute a program of formal annual inspections by a professional engineer experienced in the design and construction of dams. Utilize the inspection results to determine if remedial measures are necessary.

(5) Inspect the embankment after every flood to determine if erosion has occurred on the upstream slope. Take appropriate action as necessary.

APPENDIX A

CHECKLIST - ENGINEERING DATA

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, AND OPERATION
PHASE I

NAME OF DAM: PINETREE LAKE

NDI ID NO.: PA - 00784 DER ID NO.: 45-244

Sheet 1 of 4

A-2

ITEM	REMARKS
AS-BUILT DRAWINGS	NOT AS BUILT but design drawings.
REGIONAL VICINITY MAP	SEE PLATE E-1
CONSTRUCTION HISTORY	BUILT 1972
TYPICAL SECTIONS OF DAM	SEE PLATE E-4
OUTLETS: Plan Details Constraints Discharge Ratings	PLANS AND DETAILS: SEE PLATE E-4 NO CONSTRAINTS OR RATINGS.

ENGINEERING DATA

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	NONE
DESIGN REPORTS	BRIEF REPORT by DESIGN ENGINEER ON FILE.
GEOLOGY REPORTS	NONE
DESIGN COMPUTATIONS: Hydrology and Hydraulics (H&H) Dam Stability Seepage Studies	H&H - DESIGN REPORT INDICATES THAT THE COMMONWEALTH'S CURVE "C" WAS BASIS OF THE DESIGN.
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	SEE PLATE E-3
POSTCONSTRUCTION SURVEYS OF DAM	NONE

ENGINEERING DATA

ITEM	REMARKS
BORROW SOURCES	SEE PLATE E-2
MONITORING SYSTEMS	NONE
MODIFICATIONS	NONE
HIGH POOL RECORDS	0.2' ABOVE SPILLWAY CREST.
POSTCONSTRUCTION ENGINEERING STUDIES AND REPORTS	NONE
PRIOR ACCIDENTS OR FAILURE OF DAM: Description Reports	FAILURE OF SPILLWAY BRIDGE 1972 BRIEF REPORT by COMMONWEALTH.

ENGINEERING DATA

ITEM	REMARKS
MAINTENANCE AND OPERATION RECORDS	NONE
SPILLWAY: Plan Sections Details	SEE PLATE E-5
OPERATING EQUIPMENT: Plans Details	SEE PLATE E-4
PREVIOUS INSPECTIONS Dates Deficiencies	NONE

APPENDIX B

CHECKLIST - VISUAL INSPECTION

A-1

CHECKLIST

VISUAL INSPECTION

PHASE I

Name of Dam: PINETREE LAKE **County:** MONROE **State:** PENNSYLVANIA

NDI ID No.: PA-00784 **DER ID No.:** 45-244

Type of Dam: EARTHFILL **Hazard Category:** SIGNIFICANT

Date(s) Inspection: 14 November 1979 **Weather:** CLEAR - WINDY **Temperature:** ____

SOIL CONDITIONS: VERY MOIST

Pool Elevation at Time of Inspection: 1868.2 msl/**Tailwater at Time of Inspection:** 1845.3 msl

TAILWATER AT SPILLWAY

Inspection Personnel:

R.A. MATTICE (EMERALD LAKES)

D. WILSON (GFCC)

D. EBERSOLE (GFCC)

A. WHITMAN (GFCC) **Recorder**

EMBANKMENT

Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	NONE	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE	
SLOUGHING OR EROSION: **Embankment Slopes** **Abutment Slopes**	NONE	
CREST ALIGNMENT: **Vertical** **Horizontal**	HORIZONTAL - NO DEFICIENCIES. VERTICAL - SEE SURVEY DATA FOLLOWING INSPECTION FORMS.	
RIPRAP FAILURES	NO FAILURES	RIPRAP GRADATION UNEVEN. RIPRAP IS NO [illegible] THAN COBBLES JUST TO LEFT OF [illegible].

EMBANKMENT

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: **Abutment** **Spillway** **Other Features**	No deficiencies	
ANY NOTICEABLE SEEPAGE	Slight flow in old streambed.	Probably surface runoff
STAFF GAGE AND RECORDER	None	
DRAINS	Trickling at outfall	Right drain - flow not estimated, very small Left drain - 0.25 gpm
VEGETATION	Minor bare areas on downstream slope - no erosion	

OUTLET WORKS

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	CORRUGATED METAL PIPE (CMP)	PIPE RUSTY AT OUTFALL, 2 REINFORCING BARS PROTRUDING FROM PIPE.
INTAKE STRUCTURE	SUBMERGED	
OUTLET STRUCTURE	GOOD CONDITION	
OUTLET CHANNEL	NATURAL STREAM	
EMERGENCY GATE	SUBMERGED OPERATION NOT VIEWED	MAINTENANCE SUPERVISOR REPORTED THAT GATE IS OPERATED ANNUALLY AND 3 WEEKS PREVIOUSLY

UNGATED SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	CONTROL SECTION GOOD CONDITION	
APPROACH CHANNEL	RESERVOIR	
DISCHARGE CHANNEL	BRIDGE ABUTMENT WALLS - FINE CRACKS AT UPSTREAM ENDS (1/8" OPEN) LEACHING AT 1 CRACK. SOME DRAINS TRICKLING.	SHRINKAGE CRACKS IN CHUTE WALLS. LEFT WALL AT DOWNSTREAM END UNDERMINED 2'
BRIDGE AND PIERS	NO PIERS BRIDGE - GOOD CONDITION.	

INSTRUMENTATION

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	NONE AT SITE	
OBSERVATION WELLS		
WEIRS		
PIEZOMETERS		
OTHER	NONE AT SITE	

DOWNSTREAM CHANNEL

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION: **Obstructions** **Debris** **Other**	AT DAMSITE - CHANNEL CLEAR	
SLOPES	OVERBANKS - MILD SLOPES	
APPROXIMATE NUMBER OF HOMES AND POPULATION		
	BACKWATER FLOODING FROM I-380 EMBANKMENT IS PROBABLE. AT PRESENT TOTAL OF 1 DWELLING WOULD BE FLOODED.	

RESERVOIR AND WATERSHED

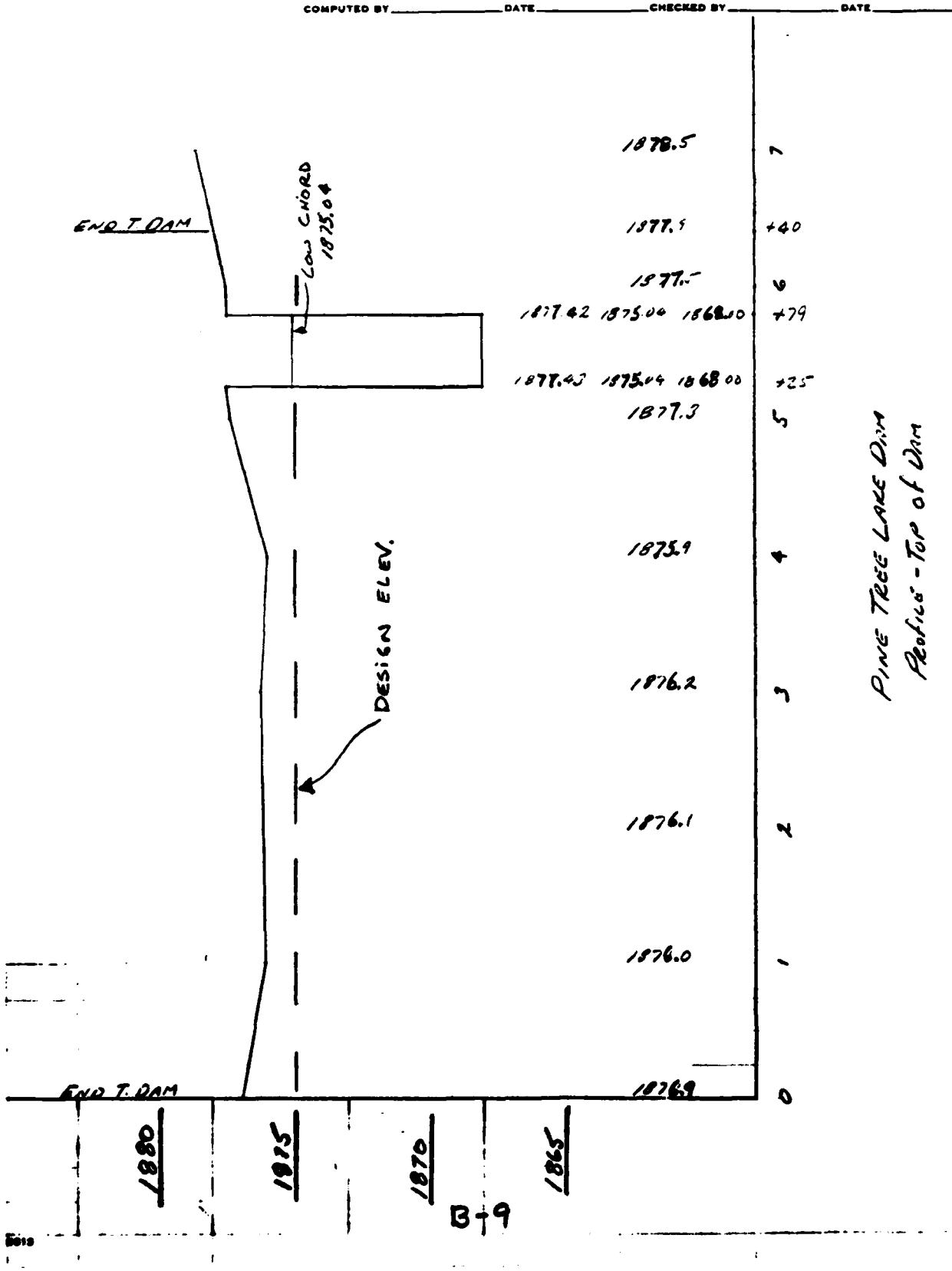
Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	MILD	
SEDIMENTATION	No Observed OR Reported Problems	
WATERSHED DESCRIPTION	Scrub brush with structures within development scattered throughout.	Existing development, although significant, should have negligible affect on hydrology.
Emerald Lakes	See Plate E-1 and survey data following inspection forms.	

E-8

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____



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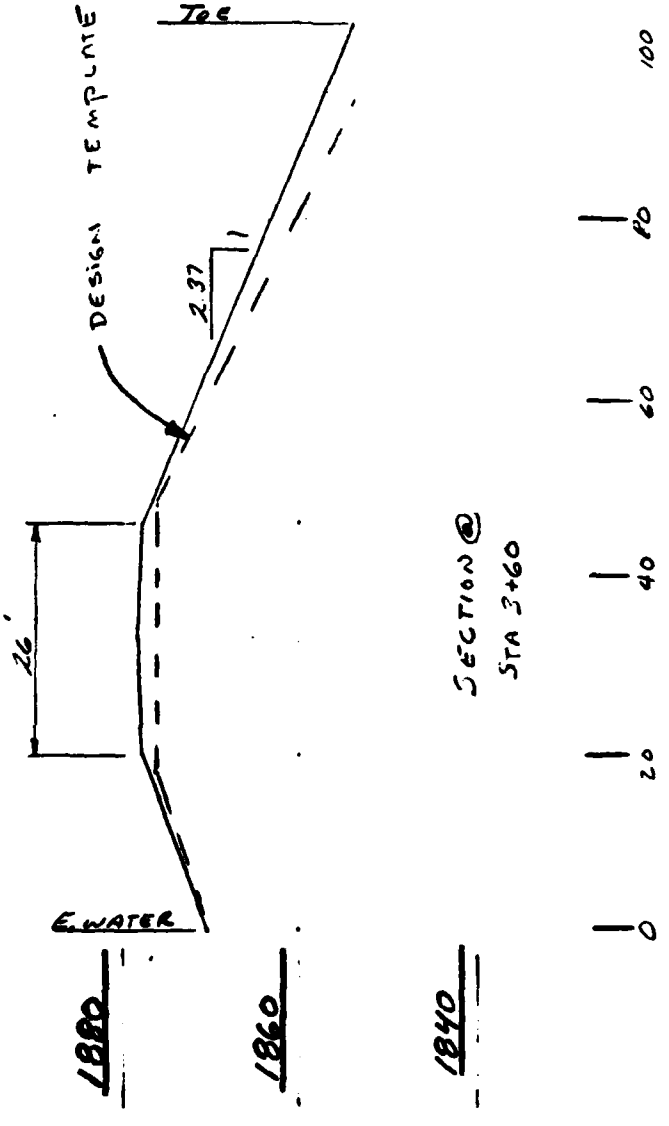
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____



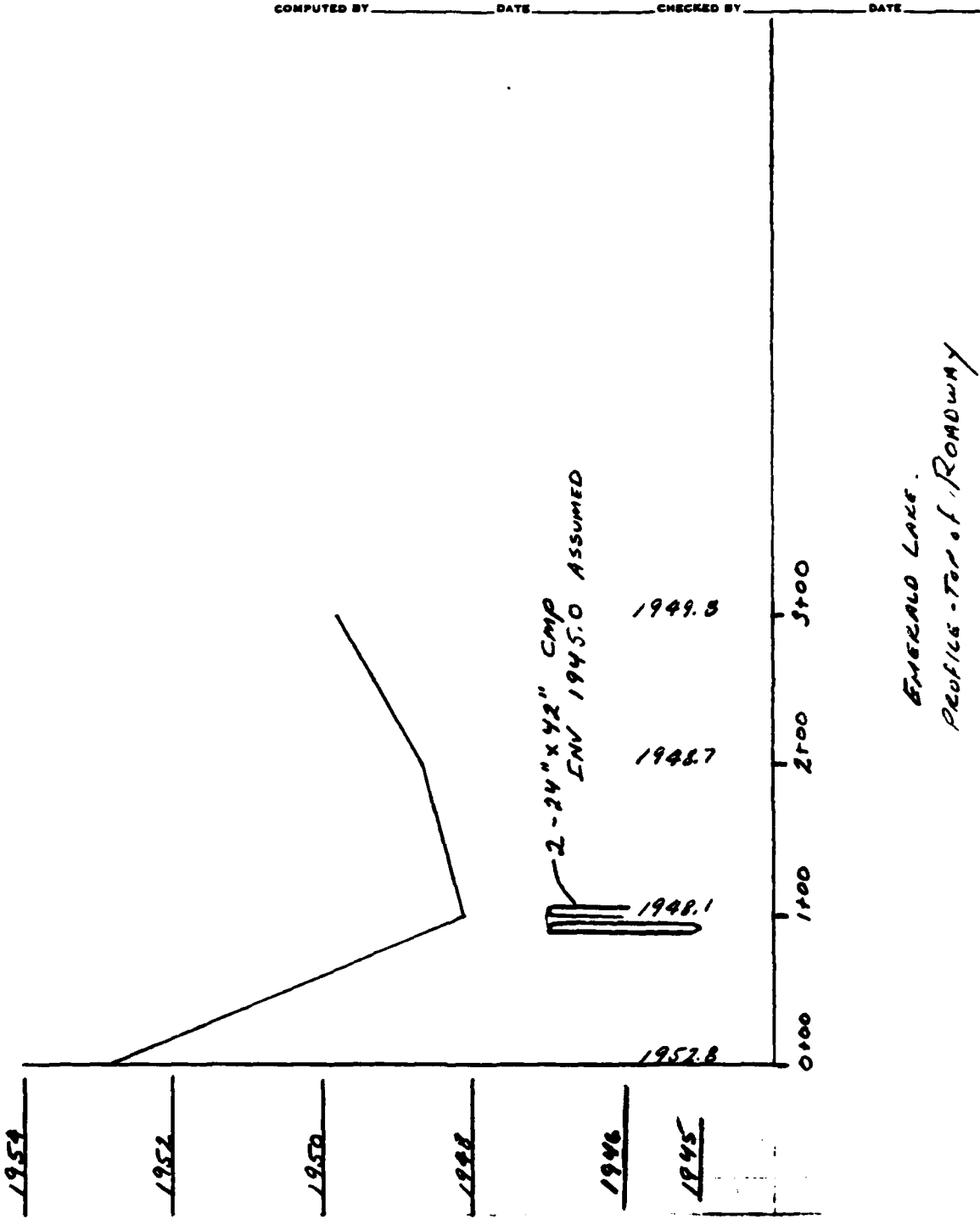
SECTION @
STA 3+60

PINE TREE LAKE DAM
SCALE: 1" = 20'

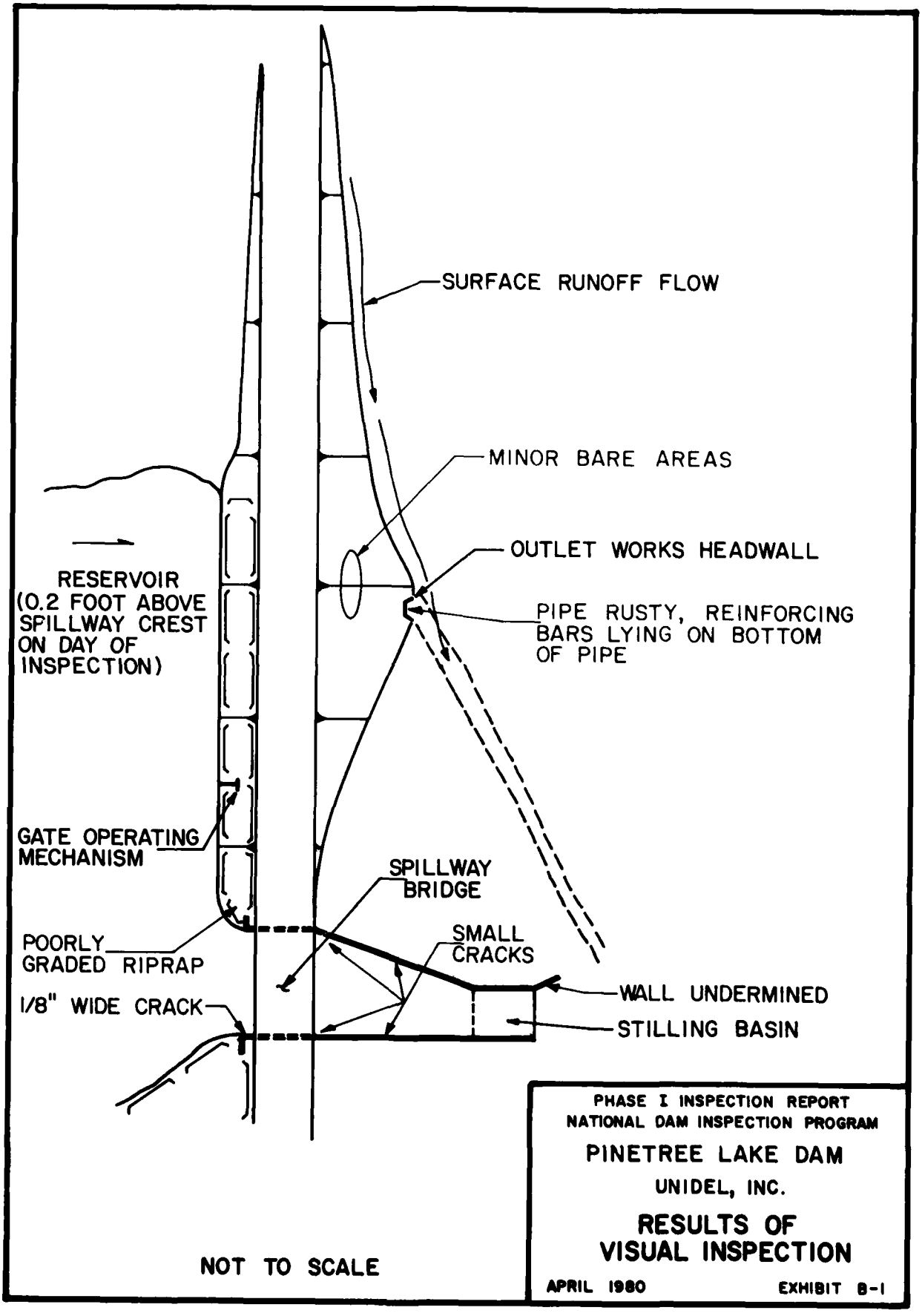
5013

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____



B-11



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PINETREE LAKE DAM

UNIDEL, INC.

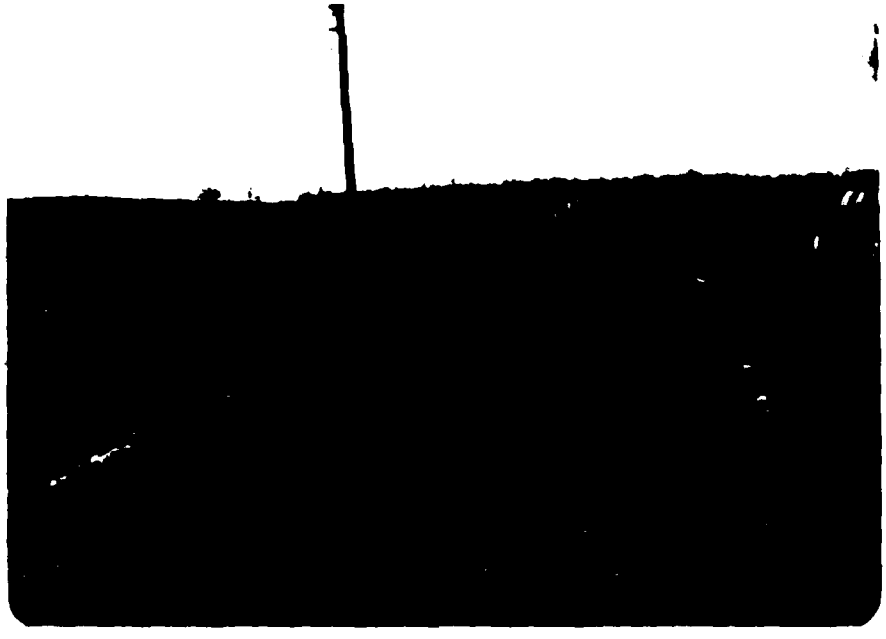
RESULTS OF VISUAL INSPECTION

APRIL 1980 EXHIBIT B-1

APPENDIX C

PHOTOGRAPHS

PINETREE LAKE DAM



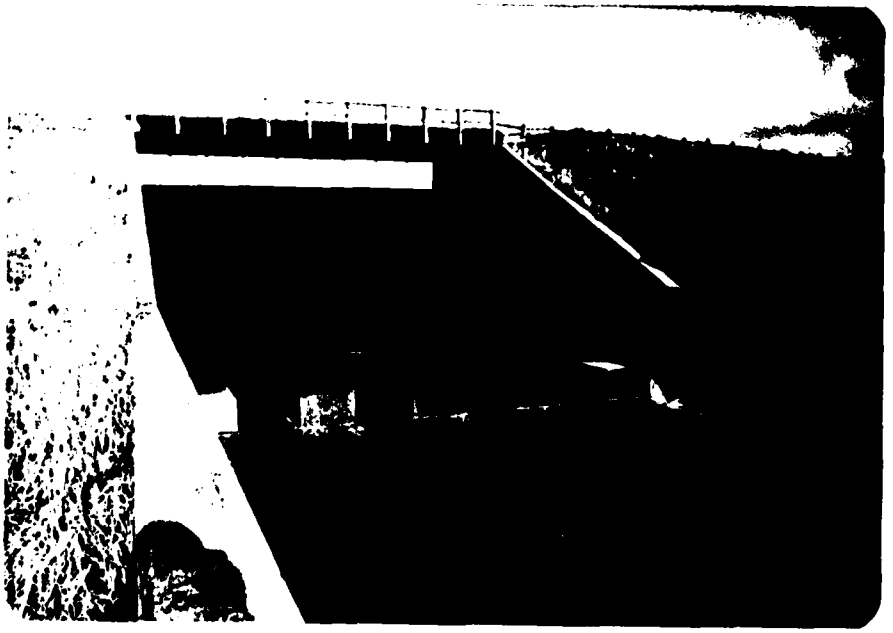
A. Downstream Slope.

B. Downstream Slope.

C. Upstream Slope Near Spillway.

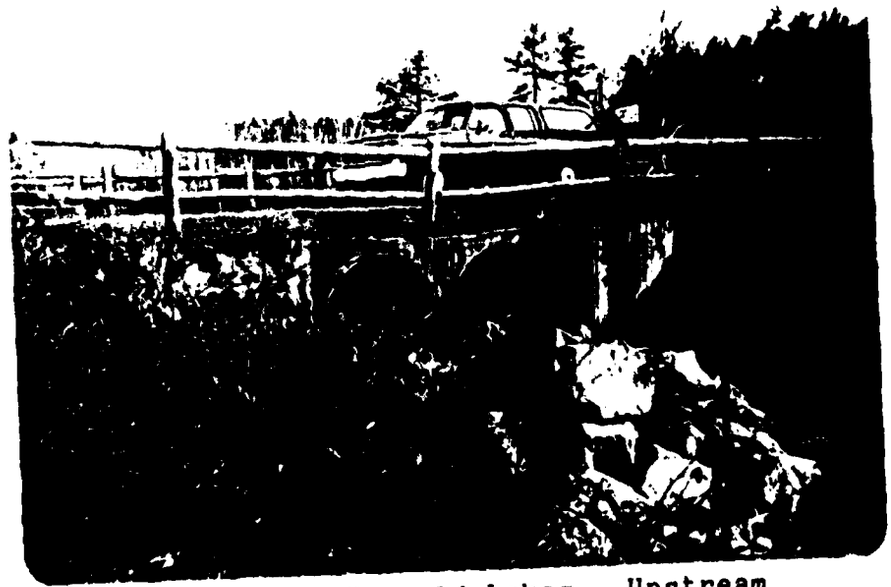
D. Gate Operating Mechanism.

E. Outlet Works Outfall.

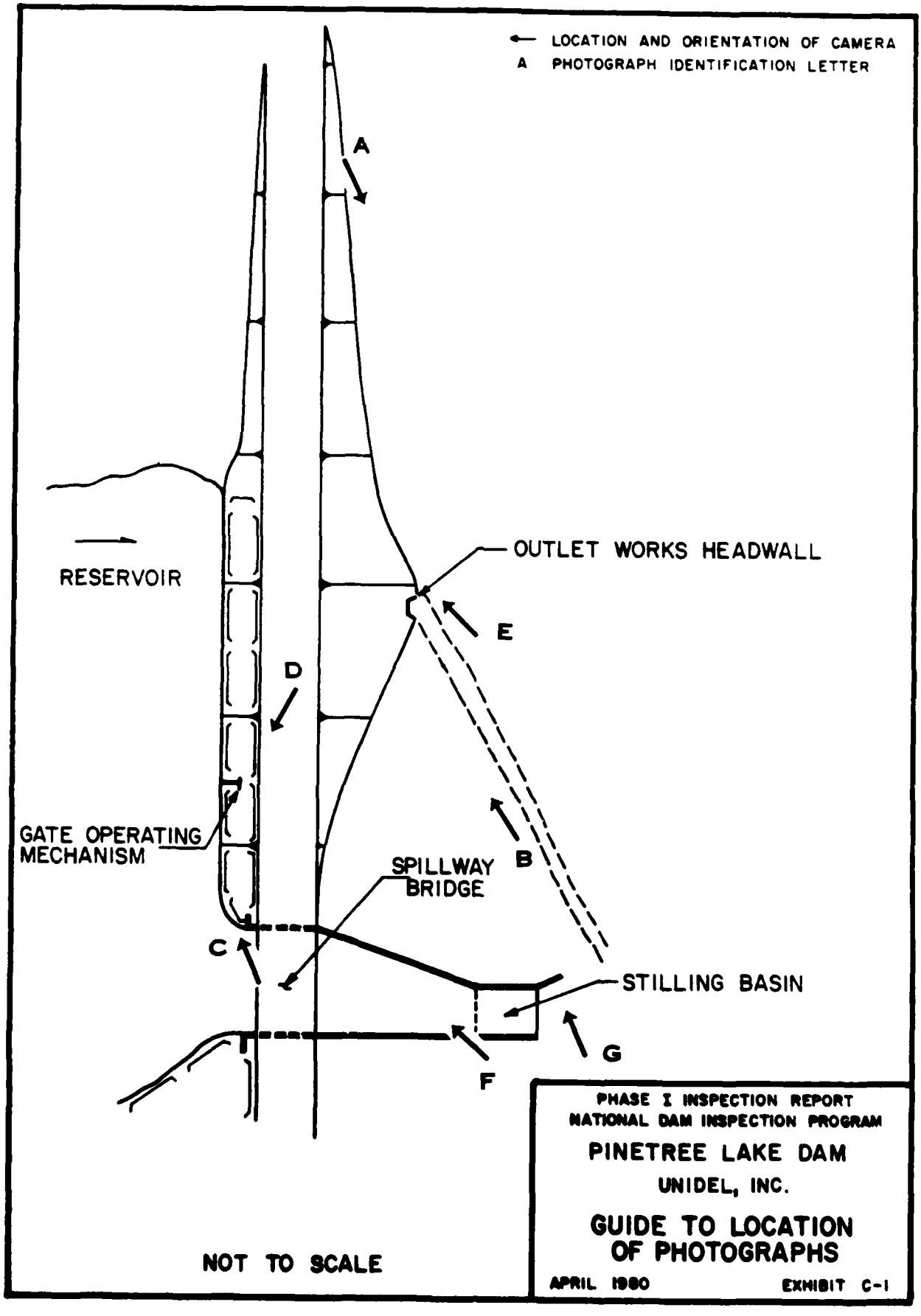


F. Spillway Chute.

G. Retaining Wall Near Stilling Basin.



H. Outlet at Emerald Lakes - Upstream of Pinetree Lake Dam.


← LOCATION AND ORIENTATION OF CAMERA
A PHOTOGRAPH IDENTIFICATION LETTER
A
RESERVOIR
OUTLET WORKS HEADWALL
E
D
GATE OPERATING MECHANISM
SPILLWAY BRIDGE
B
C
STILLING BASIN
G
F
NOT TO SCALE
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PINETREE LAKE DAM
UNIDEL, INC.
GUIDE TO LOCATION OF PHOTOGRAPHS
APRIL 1980
EXHIBIT C-1

APPENDIX D

HYDROLOGY AND HYDRAULICS

APPENDIX D

HYDROLOGY AND HYDRAULICS

Spillway Capacity Rating:

In the recommended Guidelines for Safety Inspection of Dams, the Department of the Army, Office of the Chief of Engineers (OCE), established criteria for rating the capacity of spillways. The recommended Spillway Design Flood (SDF) for the size (small, intermediate, or large) and hazard potential (low, significant, or high) classification of a dam is selected in accordance with the criteria. The SDF for those dams in the high hazard category varies between one-half of the Probable Maximum Flood (PMF) and the PMF. If the dam and spillway are not capable of passing the SDF without overtopping failure, the spillway capacity is rated as inadequate. If the dam and spillway are capable of passing one-half of the PMF without overtopping failure, or if the dam is not in the high hazard category, the spillway capacity is not rated as seriously inadequate. A spillway capacity is rated as seriously inadequate if all of the following conditions exist:

(a) There is a high hazard to loss of life from large flows downstream of the dam.

(b) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

(c) The dam and spillway are not capable of passing one-half of the PMF without overtopping failure.

Description of Model:

If the Owner has not developed a PMF for the dam, the watershed is modeled with the HEC-1DB computer program, which was developed by the U.S. Army Corps of Engineers. The HEC-1DB computer program calculates a PMF runoff hydrograph (and percentages thereof) and routes the flows through both reservoirs and stream sections. In addition, it has the capability to simulate an overtopping dam failure. By modifying the rainfall criteria, it is also possible to model the 100-year flood with the program.

APPENDIX D

DELAWARE River Basin
Name of Stream: DRY SAWMILL RUN
Name of Dam: PINETREE LAKE DAM
NDI ID No.: PA-00764
DER ID No.: 45-244
Latitude: N 41° 04' 50" Longitude: W 75° 24' 25"
Top of Dam Elevation: 1875
Streambed Elevation: 1850 Height of Dam: 25 ft
Reservoir Storage at Top of Dam Elevation: 355 acre-ft
Size Category: SMALL
Hazard Category: SIGNIFICANT (see Section 5)
Spillway Design Flood: VARIES, 100-YR TO ½ PMF
SELECT ½ PMF BASED ON SITE CONDITIONS.

UPSTREAM DAMS

Name	Distance from Dam (miles)	Height (ft)	Storage at top of Dam Elevation (acre-ft)	Remarks
EMERALD LAKES	1.0	N/A		NATURAL IMPOUNDMENT

DOWNSTREAM DAMS

NONE				

DELAWARE River Basin

Name of Stream: DRY SAWMILL RUN

Name of Dam: PINETREE LAKE DAM

DETERMINATION OF PMF RAINFALL & UNIT HYDROGRAPH

UNIT HYDROGRAPH DATA:

Sub-area	Drainage Area (square miles)	Cp (1)	Ct (2)	L miles (3)	L_{ca} miles (4)	L' miles (5)	Tp hours (6)	Map Area (7)	Plate (8)
A-1	0.62	0.45	2.1	1.136	0.379	N/A	1.63	2	E
A-2	0.91	0.45	2.1	1.36	0.75	N/A	2.11	2	B
Total	1.53	★							

(See Sketch on Sheet D-4)

(1) & (2): Snyder Unit Hydrograph coefficients supplied by Baltimore District, Corps of Engineers on maps and plates referenced in (7) & (8)

The following are measured from the outlet of the subarea:

(3): Length of main watercourse extended to divide

(4): Length of main watercourse to the centroid

The following is measured from the upstream end of the reservoir at normal pool:

(5): Length of main watercourse extended to divide

(6): $Tp=C_t \times (L \times L_{ca})^{0.3}$, except where the centroid of the subarea is located in the reservoir. Then $Tp=C_t \times (L')^{0.6}$

Initial flow is assumed at 1.5 cfs/sq. mile

Computer Data: QRCSN = -0.05 (5% of peak flow)
RTIOR = 2.0

RAINFALL DATA:

PMF Rainfall Index= 22.2 in., 24 hr., 200 sq. mile

	Hydromet. 40 (Susquehanna Basin)	Hydromet. 33 (Other Basins)
Zone:	N/A	1
Geographic Adjustment Factor:	N/A	1.0
Revised Index Rainfall:	N/A	22.2

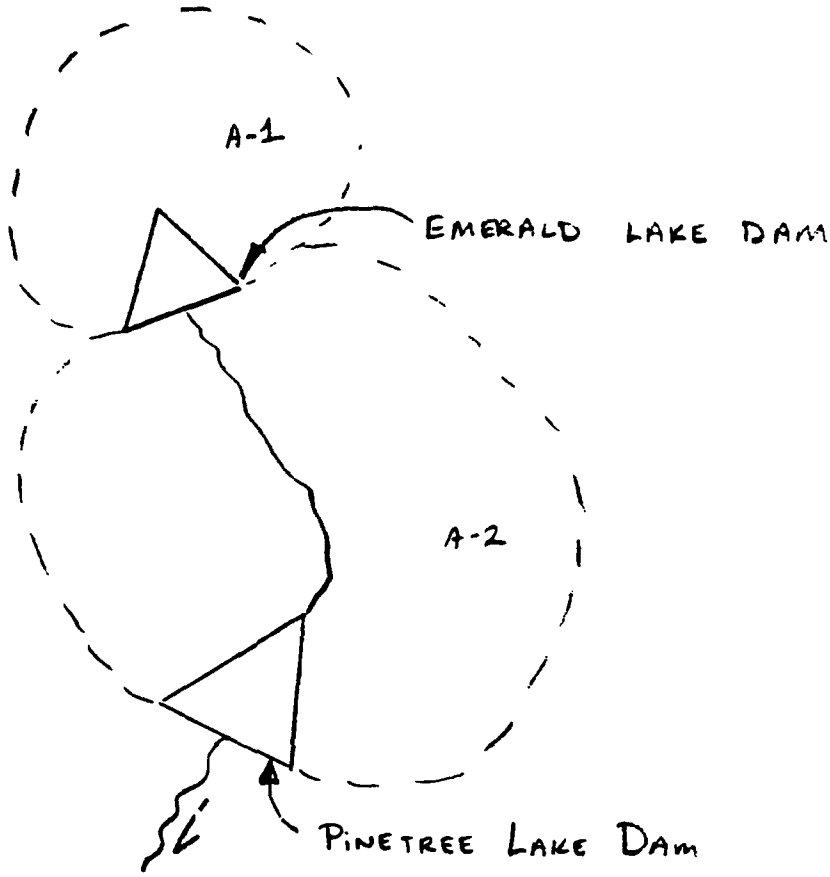
RAINFALL DISTRIBUTION (percent)

Time	Percent
6 hours	111
12 hours	123
24 hours	133
48 hours	142
72 hours	N/A
96 hours	N/A

★ OWNERS COMPUTATIONS INDICATE 1005 ACRES = 1.57 mi.sq.

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
_____ SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____



SKETCH
OF
SYSTEM

8913

Data for Dam at Outlet of Subarea A-1 (See sketch on Sheet D-4)

Name of Dam: EMERALD LAKES

STORAGE DATA:

Elevation		Area (acres)		Storage million gals	Storage acre-ft		Remarks
1925	=ELEVO*	0		0	0		ASSUMED
1945	=ELEV1	41	=A1		273	=S1*	
							ONLY SURCHARGE STORAGE IS RELEVANT
1960	**	117					

* ~~ELEVO — ELEV1 — $(3S_1/A_1)$~~ $S_1 = (ELEV1 - ELEVO) \times A1/3$

** Planimetered contour at least 10 feet above top of dam

Reservoir Area at Normal Pool is 11 percent of subarea watershed.

BREACH DATA: NOT USED

See Appendix B for sections and existing profile of the dam.

Soil Type from Visual Inspection: _____

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) _____ fps
(from $Q = CLH^{3/2} = V \cdot A$ and depth = (2/3) x H) & A = L·depth

HMAX = $(4/9\ V^2/C^2)$ = _____ ft., C = ____ Top of Dam El.= ____

HMAX + Top of Dam El. = _____ = FAILEL
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = _____ ft (width of bottom of breach)
Z = _____ (side slopes of breach)
ELBM = _____ (bottom of breach elevation, minimum of zero storage elevation)
WSEL = _____ (normal pool elevation)
T FAIL= _____ mins = _____ hrs (time for breach to develop)

Data for Dam at Outlet of Subarea A-1

Name of Dam: EMERALD LAKES

SPILLWAY DATA: No Spillway

	Existing Conditions	Design Conditions
Top of Dam Elevation		
Spillway Crest Elevation		
Spillway Head Available (ft)		
Type Spillway		
"C" Value - Spillway		
Crest Length - Spillway (ft)		
Spillway Peak Discharge (cfs)		
Auxiliary Spillway Crest Elev.		
Auxiliary Spill. Head Avail. (ft)		
Type Auxiliary Spillway		
"C" Value - Auxiliary Spill. (ft)		
Crest Length - Auxil. Spill. (ft)		
Auxiliary Spillway Peak Discharge (cfs)		
Combined Spillway Discharge (cfs)		

Spillway Rating Curve: No Spillway - TOP OF ROADWAY USED AS TOP OF DAM - SEE APP. B

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)

OUTLET WORKS RATING:	Outlet 1	Outlet 2	Outlet 3 = 1 + 2
Invert of Outlet	1945.0	1945.0	1945.0
Invert of Inlet	1945.0	1945.0	1945.0
Type	CMP	CMP	
Diameter (ft) = D	2' x 3.5'	2' x 3.5'	
Length (ft) = L	30+/-	30±	
Area (sq. ft) = A	5.50	5.50	11.00
N	.024	.024	
K Entrance	0.5	0.5	
K Exit	1.0	1.0	
K Friction=$29.1_N{}^2L/R^{4/3}$	.92	.92	
Sum of K	2.42	2.42	2.42
$(1/K)^{0.5} = C$	0.64	0.64	0.64
Maximum Head (ft) = HM	N/A	N/A	N/A
$Q = CA\sqrt{2g(HM)}$ (cfs)	N/A	N/A	N/A
Q Combined (cfs)	N/A	N/A	N/A

Data for Dam at Outlet of Subarea A-2 (See sketch on Sheet D-4)

Name of Dam: PINETREE LAKE DAM

STORAGE DATA:

Elevation		Area (acres)		Storage million gals	acre-ft		Remarks
1853.7	=ELEVO*	0		0	0		Floor
1854.0	=ELEV1	.01	=A1		.001	=S1	PLATE
1860.0		7.77			16.11		E-3
1865.0		15.97			74.25		
1868.0		20.1			128.24 †		Spillway
1875.0		46.5			355		Top Dam
1880.0	**	72					
† Design Data		18.5 Acres,		143 Acre-ft			

* ELEVO = ELEV1 - $(3S_1/A_1)$

** Planimetered contour at least ~~10~~ 5 feet above top of dam

Reservoir Area at Normal Pool is 3 percent of subarea watershed.

BREACH DATA: Not Used

See Appendix B for sections and existing profile of the dam.

Soil Type from Visual Inspection: _____

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) _____ fps
(from $Q = CLH^{3/2} = V \cdot A$ and depth = (2/3) x H) & A = L·depth

HMAX = $(4/9\ V^2/C^2)$ = _____ ft., C = ____ Top of Dam El.= ____

HMAX + Top of Dam El. = _____ = FAILEL
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = _____ ft (width of bottom of breach)
Z = _____ (side slopes of breach)
ELBM = _____ (bottom of breach elevation, minimum of zero storage elevation)
WSEL = _____ (normal pool elevation)
T FAIL= _____ mins = _____ hrs (time for breach to develop)

Data for Dam at Outlet of Subarea A-2

Name of Dam: PINETREE LAKE

SPILLWAY DATA:	Existing Conditions	Design Conditions
Top of Dam Elevation	1875.0†	SAME
Spillway Crest Elevation	1868.0	
Spillway Head Available (ft)	7.0	
Type Spillway	CONCRETE CHUTE	
"C" Value - Spillway	3.1	
Crest Length - Spillway (ft)	54	
Spillway Peak Discharge (cfs)	3100	
Auxiliary Spillway Crest Elev.	NONE	
Auxiliary Spill. Head Avail. (ft)		
Type Auxiliary Spillway		
"C" Value - Auxiliary Spill. (ft)		
Crest Length - Auxil. Spill. (ft)		
Auxiliary Spillway Peak Discharge (cfs)	NONE	
Combined Spillway Discharge (cfs)	3100	SAME

† EMBANKMENT ABOVE EL 1875.0 - RATING IS AT DESIGN ELEV.

Spillway Rating Curve: $Q = CLH^{3/2}$

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)

OUTLET WORKS RATING:	Outlet 1	Outlet 2	Outlet 3
Invert of Outlet	1852.0		
Invert of Inlet	1856.5		
Type	CMP		
Diameter (ft) = D	1.5		
Length (ft) = L	148		
Area (sq. ft) = A	1.77		
N	0.024		
K Entrance	0.5		
K Exit	1.0		
K Friction=$29.1N^2L/R^{4/3}$	9.15		
Sum of K	10.65		
$(1/K)^{0.5} = C$	0.30		
Maximum Head (ft) = HM	22.		
$Q = CA\sqrt{2g(HM)}$ (cfs)	19.98		
Q Combined (cfs)	≈ 20		

Selected Computer Output

```
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  17 JAN 80
```

```
    1                A1                        NATIONAL DAM INSPECTION PROGRAM
    2                A2                           DRY SAWMILL CREEK
    3                A3                         PINETREE LAKE DAM
    4                R    300       0      15       0       0       0       0       0      -4       0
    5                B1     5
    6                J      1       6       1
    7                J1     1      .9      .8      .7      .6      .5
    8                K      0       1                                       1
    9                K1       RUNOFF INTO EMERALD LAKE
   10                M      1       1   0.62                1.53                                   1
   11                P              22.2     111     123     133     142
   12                T                                                       1     .05             .11
   13                W   1.63     .45
   14                X   -1.5    -.05     2.0
   15                K      1       1                                       1
   16                K1       ROUTE THROUGH EMERALD LAKES
   17                Y                               1
   18                Y1     1                                        -1945
   19                SA     0      41     117
   20                SE  1925    1945    1960
   21                SS  1945   .0001   .0001     1.5 1946.75     .64      11     0.5
   22                SD1948.1
   23                SL     1     115     235     285     300
   24                SV1948.1  1948.7  1948.8  1952.8    1960
   25                K      1       2                                       1
   26                K1       ROUTE DOWNSTREAM
   27                Y                               1
   28                Y1     1                                          -1
   29                Y6    .1     .06      .1  1914.5    1925    2000   .0047
   30                Y7     0    1925      90    1920     410    1915     600  1914.5     770    1915
   31                Y7   790    1920     815    1925     830    1930
   32                K      1       3                                       1
   33                K1       ROUTE DOWNSTREAM
   34                Y                               1
   35                Y1     1                                          -1
   36                Y6    .1     .06      .1    1895    1906    3700   .011
   37                Y7     0    1910      20    1905      40    1900     180  1895      230    1895
   38                Y7   245    1900     270    1905     300    1906
   39                K      0       3                                       1
   40                K1       UNCONTROLLED RUNOFF INTO PINETREE LAKE
   41                M      1       1    .91                1.53                                   1
   42                P              22.2     111     123     133     142
   43                T                                                       1     .05             .03
   44                W   2.11     0.45
   45                X   -1.5    -.05     2.0
   46                K      2       3                                       1
   47                K1       COMBINE RUNOFF INTO PINETREE LAKE
   48                K      1       3                                       1
   49                K1       ROUTE THROUGH PINETREE LAKE DAM
   50                Y                               1
```

D-10

								-1868
51	Y1	1						
52	SA	0	.01	7.77	15.97	20.1	72	
53	SE	1853.7	1854	1860	1865	1868	1880	
54	SS	1868	54	3.1	1.5			
55	SD	1875						
56	SL	510	510					
57	SV	1875	1880					
58	K	99						

D-11

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS					
				RATIO 1 1.00	RATIO 2 .90	RATIO 3 .80	RATIO 4 .70	RATIO 5 .60	RATIO 6 .50
HYDROGRAPH AT	1	.62	1	1387.	1248.	1110.	971.	832.	694.
	(	1.61)	(	39.28)(	35.35)(	31.42)(	27.49)(	23.57)(	19.64)(
ROUTED TO	1	.62	1	1273.	1126.	975.	818.	652.	476.
	(	1.61)	(	36.06)(	31.83)(	27.60)(	23.16)(	18.47)(	13.48)(
ROUTED TO	2	.62	1	1268.	1119.	969.	812.	647.	465.
	(	1.61)	(	35.91)(	31.68)(	27.42)(	22.99)(	18.31)(	13.17)(
ROUTED TO	3	.62	1	1261.	1113.	963.	806.	640.	460.
	(	1.61)	(	35.72)(	31.52)(	27.26)(	22.82)(	18.12)(	13.02)(
HYDROGRAPH AT	3	.91	1	1764.	1587.	1411.	1235.	1058.	882.
	(	2.36)	(	49.95)(	44.95)(	39.96)(	34.96)(	29.97)(	24.97)(
2 COMBINED	3	1.53	1	2971.	2628.	2286.	1930.	1552.	1143.
	(	3.96)	(	84.12)(	74.40)(	64.68)(	54.66)(	43.95)(	32.38)(
ROUTED TO	3	1.53	1	2741.	2427.	2110.	1780.	1439.	1079.
	(	3.96)	(	77.62)(	68.73)(	59.76)(	50.41)(	40.76)(	30.55)(

SUMMARY OF DAM SAFETY ANALYSIS

EMERALD LAKES

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1945.00	1945.00	1948.10
STORAGE	273.	273.	419.
OUTFLOW	0.	0.	66.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1949.93	1.83	525.	1273.	18.75	42.25	0.00
.90	1949.82	1.72	518.	1124.	18.00	42.50	0.00
.80	1949.70	1.60	510.	975.	17.25	42.50	0.00
.70	1949.56	1.46	502.	819.	16.50	42.75	0.00
.60	1949.41	1.31	493.	652.	15.50	43.00	0.00
.50	1949.22	1.12	482.	476.	14.75	43.50	0.00

PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	1268.	1916.3	42.50
.90	1119.	1916.2	42.50
.80	969.	1916.0	42.75
.70	812.	1915.9	43.00
.60	647.	1915.8	43.25
.50	465.	1915.6	43.75

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	1261.	1898.1	42.75
.90	1113.	1897.9	42.75
.80	963.	1897.7	43.00
.70	806.	1897.4	43.25
.60	640.	1897.2	43.50
.50	460.	1896.8	44.00

SUMMARY OF DAM SAFETY ANALYSIS

PINETREE LAKE DAM

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1868.00	1868.00	1875.00
STORAGE	128.	128.	355.
OUTFLOW	0.	0.	3100.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1874.45	0.00	330.	2741.	0.00	43.25	0.00
.90	1873.95	0.00	308.	2427.	0.00	43.25	0.00
.80	1873.42	0.00	287.	2110.	0.00	43.50	0.00
.70	1872.86	0.00	265.	1780.	0.00	43.50	0.00
.60	1872.20	0.00	242.	1439.	0.00	43.75	0.00
.50	1871.46	0.00	217.	1079.	0.00	44.25	0.00

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA.

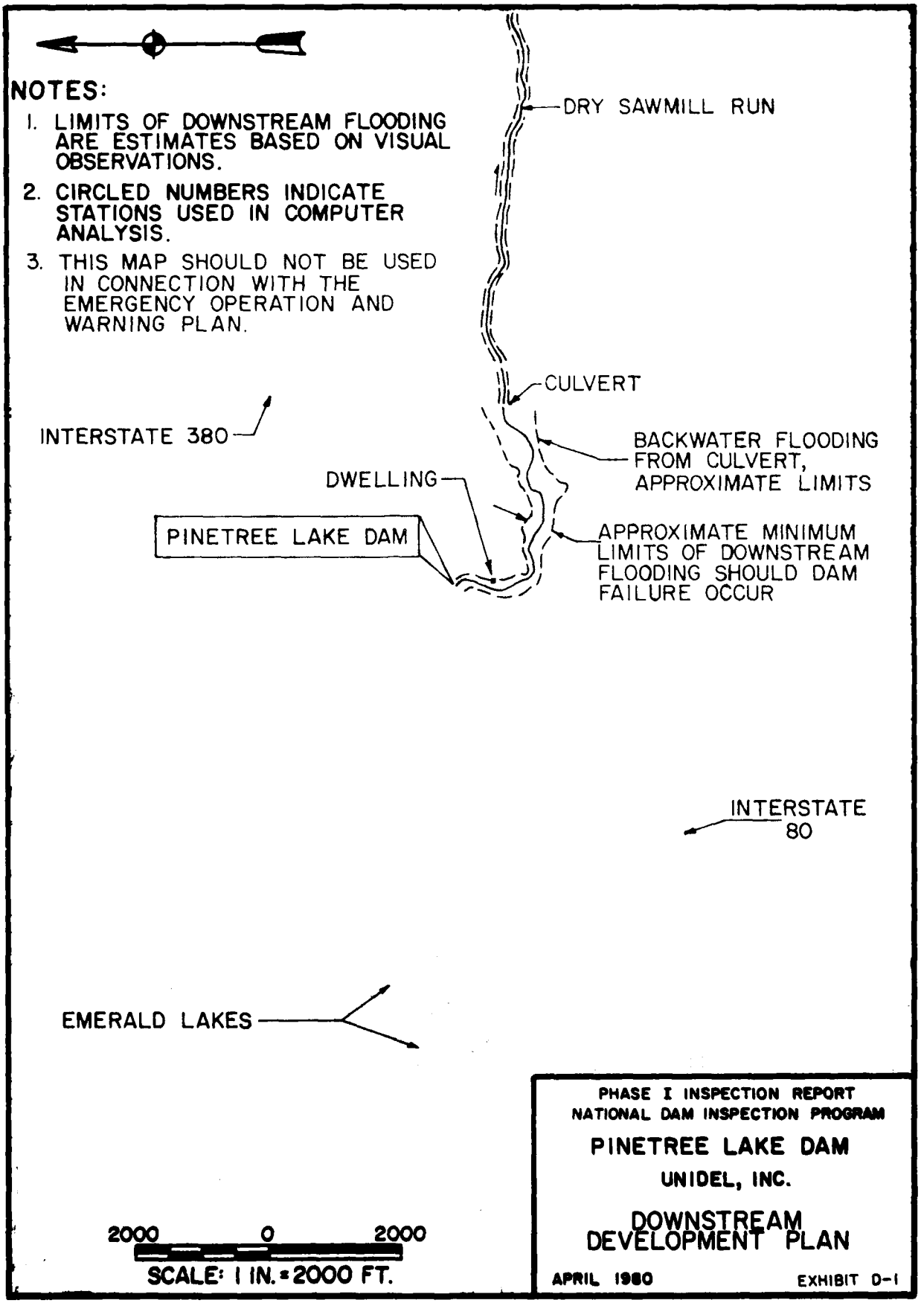
SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

SUMMARY OF RESULTS

PMF RAINFALL = 25.22"

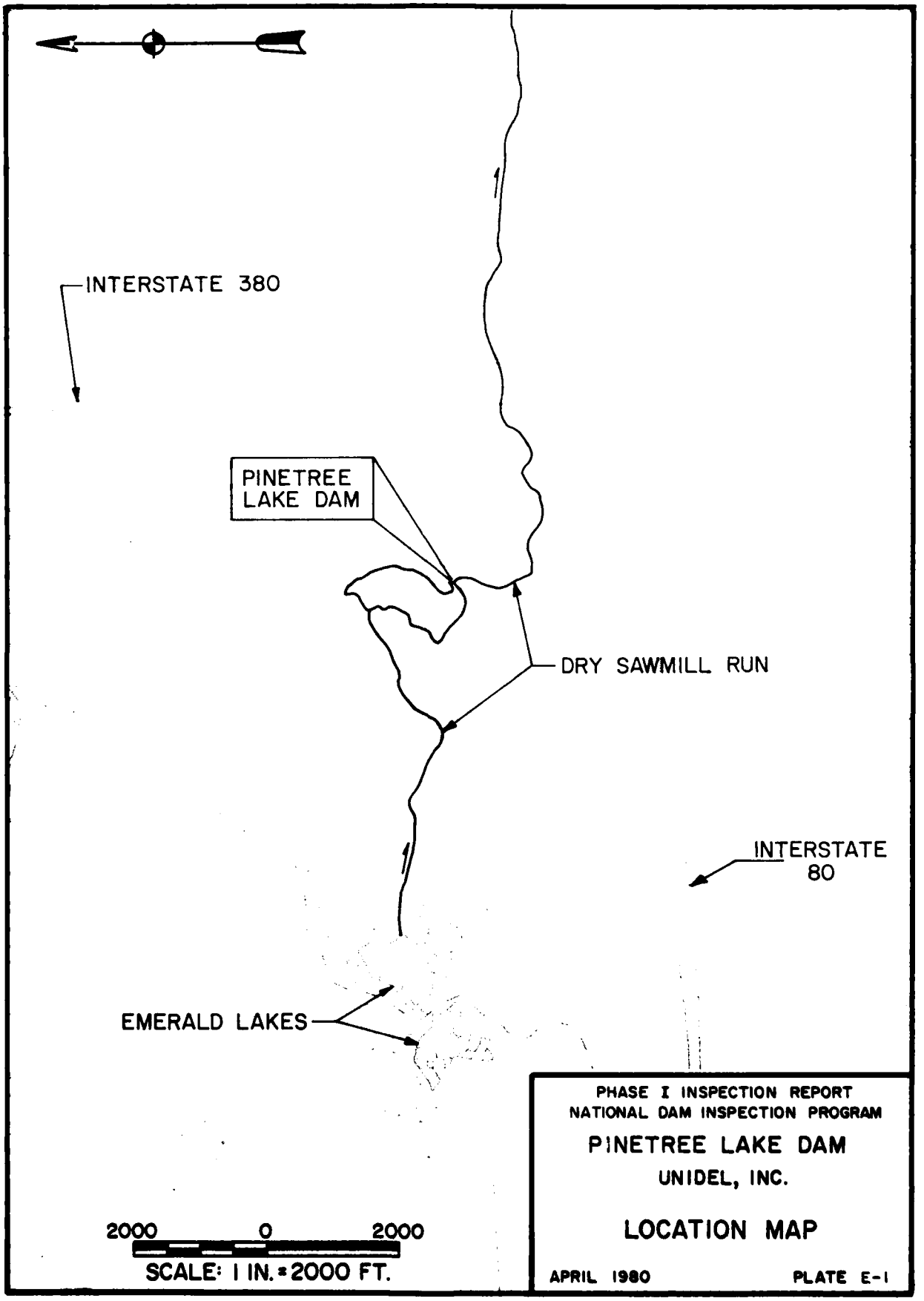
	PMF	½ PMF = SDF
RUNOFF (INCHES)	22.98	11.49
PEAK INFLOW TO EMERALD LAKES (CFS)	1387	694
PEAK OUTFLOW FROM EMERALD LAKES (CFS)	1273	476
DEPTH OF OVERTOPPING EMERALD LAKES OUTLET (FT)	1.83	1.12
DURATION OF OVERTOPPING EMERALD LAKES OUTLET (HRS)	18.75	14.75
PINETREE LAKE DAM		
PEAK INFLOW (CFS)	2971	1143
PEAK OUTFLOW (CFS)	2741	1079
FREEBOARD (FT)†	0.55	3.54

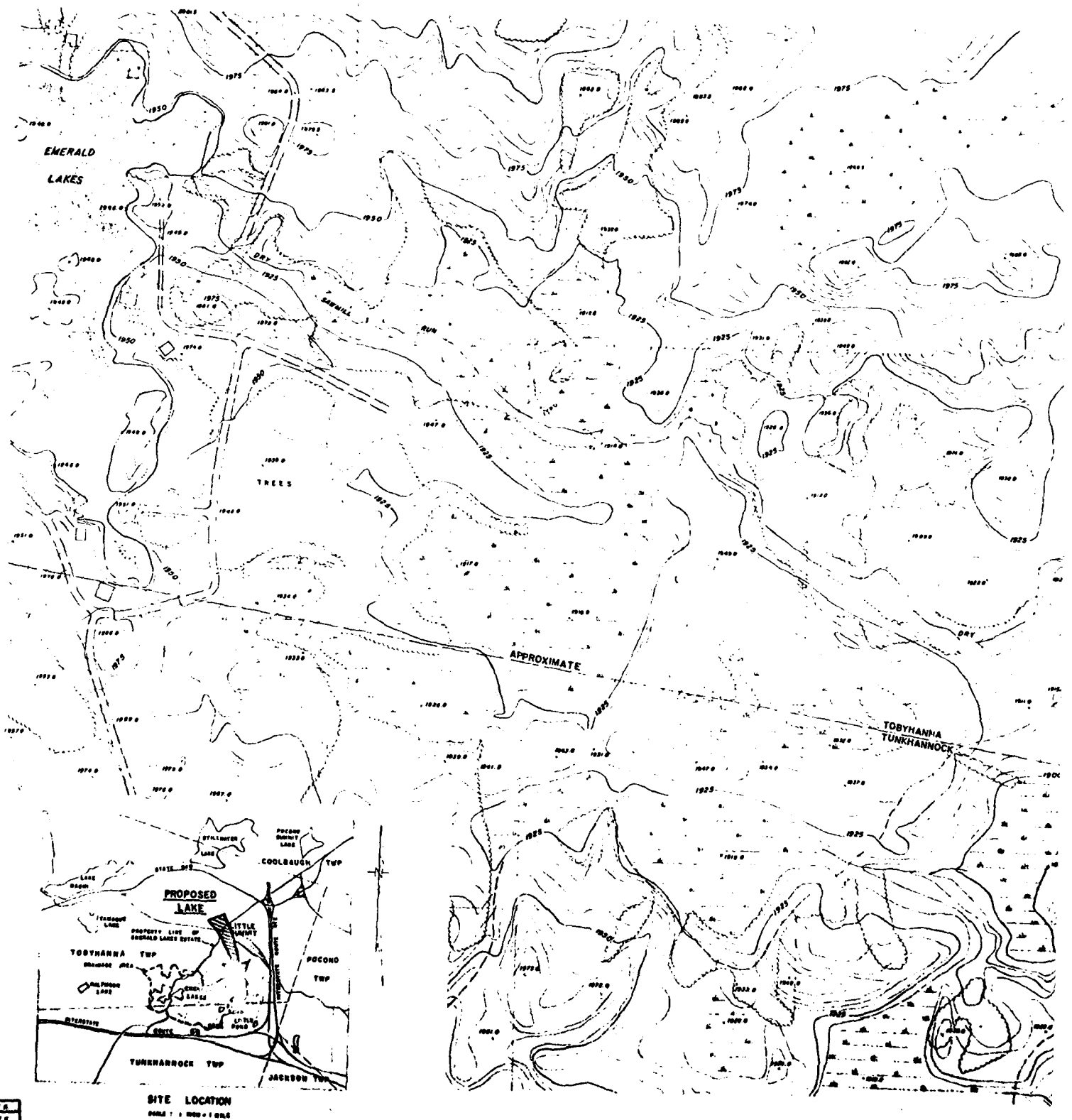
† ACTUAL FREEBOARD IS GREATER BECAUSE THE EMBANKMENT IS ABOVE DESIGN ELEVATION


NOTES:
1. LIMITS OF DOWNSTREAM FLOODING ARE ESTIMATES BASED ON VISUAL OBSERVATIONS.
2. CIRCLED NUMBERS INDICATE STATIONS USED IN COMPUTER ANALYSIS.
3. THIS MAP SHOULD NOT BE USED IN CONNECTION WITH THE EMERGENCY OPERATION AND WARNING PLAN.
DRY SAWMILL RUN
CULVERT
INTERSTATE 380
BACKWATER FLOODING FROM CULVERT, APPROXIMATE LIMITS
DWELLING
PINETREE LAKE DAM
APPROXIMATE MINIMUM LIMITS OF DOWNSTREAM FLOODING SHOULD DAM FAILURE OCCUR
INTERSTATE 80
EMERALD LAKES
2000 0 2000
SCALE: 1 IN. = 2000 FT.
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PINETREE LAKE DAM
UNIDEL, INC.
DOWNSTREAM DEVELOPMENT PLAN
APRIL 1980
EXHIBIT D-1

APPENDIX E

PLATES


INTERSTATE 380
PINETREE LAKE DAM
DRY SAWMILL RUN
INTERSTATE 80
EMERALD LAKES
2000 0 2000
SCALE: 1 IN. = 2000 FT.
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PINETREE LAKE DAM
UNIDEL, INC.
LOCATION MAP
APRIL 1980
PLATE E-1


EMERALD
LAKES
SAWMILL
RUN
TREES
APPROXIMATE
TOBYHANNA
TUNKHANNOCK
DRY
PROPOSED
LAKE
COOLBAUGH TWP
TOBYHANNA TWP
POCONO TWP
TUNKHANNOCK TWP
JACKSON TWP
PROPERTY LINE OF EMERALD LAKES ESTATE
SITE LOCATION

FILE NUMBER

RECEIVED IN THE OFFICE OF THE DEPARTMENT OF ENVIRONMENTAL RESOURCES.

ON _____

FILE CLERK

REVISIONS	EMERALD LAKES	
5-12-71 SPILLWAY REVISED & STALLING BASIN ADDED 2 DRAINAGE AREA REVISED 4 29-1 DAM RELOCATED	TOBYHANNA AND TUNKHANNOCK TWPS. MONROE COUNTY, PENNSYLVANIA	
	LOCATION MAP PROPOSED LAKE	
SCALE 1 INCH = 1000 FT.	FOGARASI AND MOYER CONSULTING CIVIL ENGINEERS ALLENTOWN, PENNSYLVANIA	70-14-02
DATE OCT. 1970		SHEET 1 OF 4

JOHN CARMINE PARISI
REGISTERED
PROFESSIONAL
ENGINEER
No. 10,000
PENNSYLVANIA

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PINETREE LAKE DAM

UNIDEL, INC.

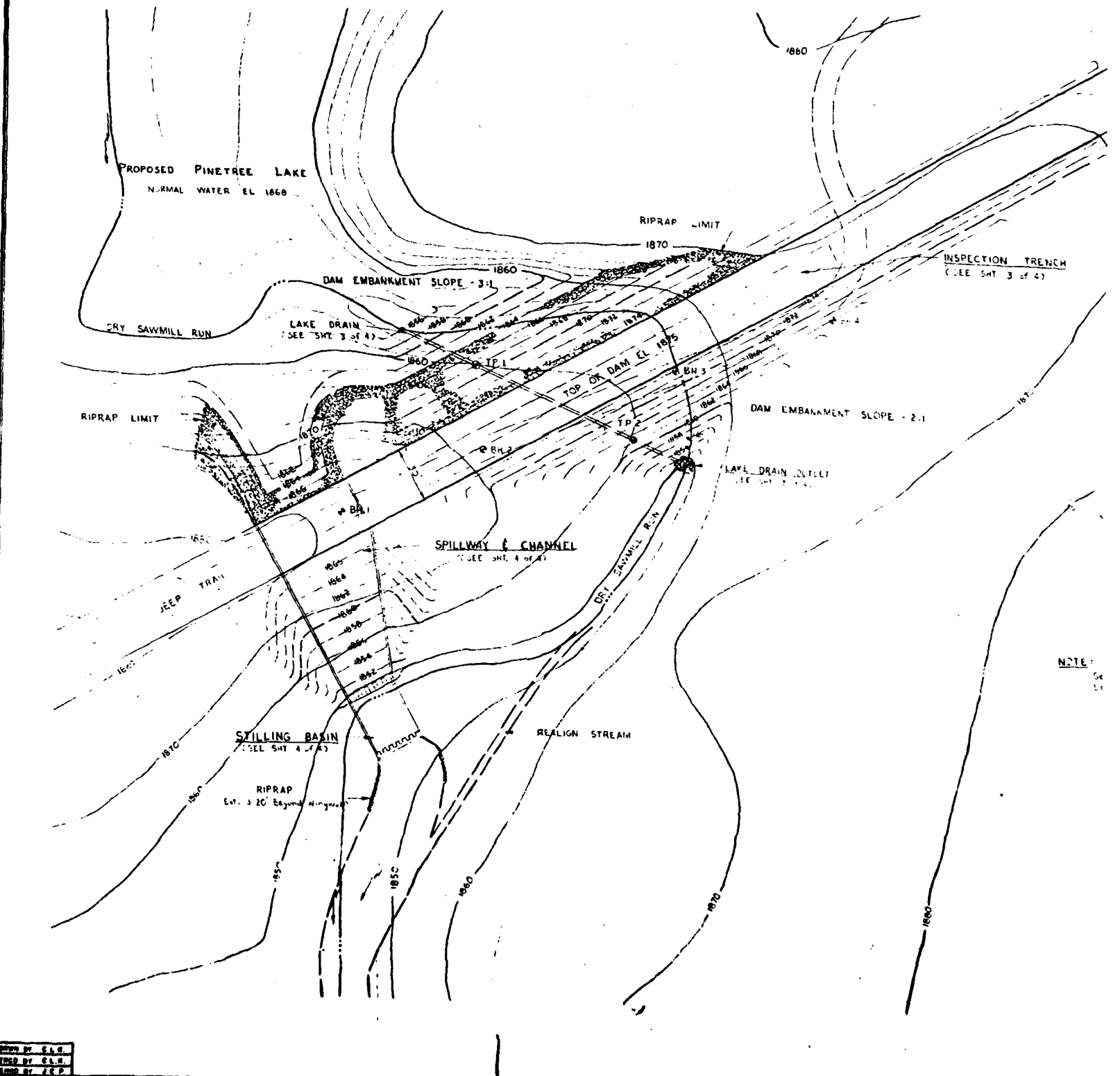
AREA PLAN

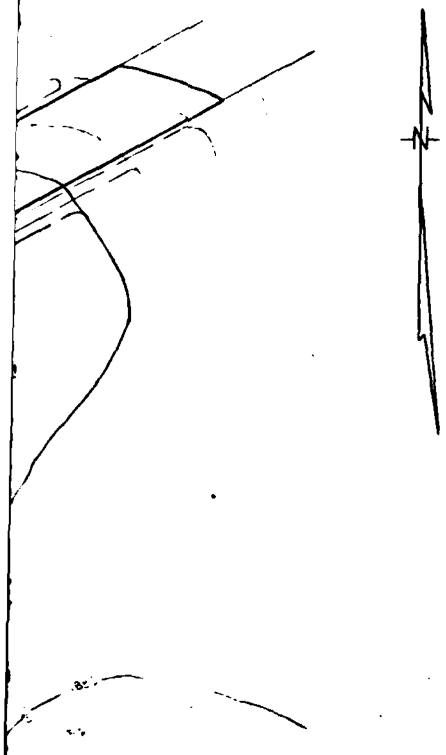
APRIL 1980

PLATE E-2

E-2 & - 4/E.

2


PROPOSED PINETREE LAKE
NORMAL WATER EL 1868
RIPRAP LIMIT
1870
1860
DAM EMBANKMENT SLOPE - 3:1
INSPECTION TRENCH
(SEE SHT 3 of 4)
DRY SAWMILL RUN
LAKE DRAIN
(SEE SHT 3 of 4)
TP 1
TOP OF DAM EL 1875
BH 3
TP 2
RIPRAP LIMIT
DAM EMBANKMENT SLOPE - 2:1
BH 2
BH 1
LAKE DRAIN OUTLET
SPILLWAY & CHANNEL
(SEE SHT 4 of 4)
JEEP TRAIL
DRY SAWMILL RUN
STILLING BASIN
(SEE SHT 4 of 4)
REALIGN STREAM
RIPRAP
Ext. 3 20' Beyond Wingwalls
1850
1860
1870



BORE HOLE 1

0'-0" - 15'-0" BROWN SANDY SILT W/ SMALL BOULDERS & ROCK FRAG. MOIST - COMPACT

15'-0" - 32'-0" BROWN CLAYEY SANDY SILT W/ ROCK FRAG. MOIST - COMPACT

BORE HOLE 2

0'-0" - 10'-0" BROWN SANDY SILT W/SMALL BOULDERS & ROCK FRAG MOIST - COMPACT

10'-0" - 11'-9" BROWN SILTY SAND W/ROCK FRAG MOIST - COMPACT

11'-9" - 22'-0" BROWN CLAYEY SANDY SILT W/ROCK FRAG MOIST - COMPACT

BORE HOLE 3

0'-0" - 5'-0" BROWN & GRAY SANDY SILT SMALL BOULDERS & ROCK FRAG. WET - COMPACT

5'-0" - 12'-0" BROWN CLAYEY SANDY SILT W/ROCK FRAG MOIST - COMPACT

BORE HOLE 4

0'-0" - 5'-6" BROWN SANDY SILT & BOULDERS

5'-6" - 18'-0" BROWN CLAYEY SANDY SILT W/ROCK FRAG. MOIST - COMPACT

TEST PIT 1

0'-0" - 4'-0" BROWN & GRAY SANDY SILT W/ ROCK FRAG. MOIST - COMPACT

4'-0" - 10'-0" BROWN CLAYEY SILT W/ROCK FRAG MOIST - COMPACT

NOTE:
See Sheet 4 of 4 For Longitudinal Section of Dam.

TEST PIT 2

0'-0" - 4'-6" BROWN & GRAY SANDY SILT SMALL BOULDERS & ROCK FRAG WET - COMPACT

4'-6" - 9'-0" BROWN CLAYEY SANDY SILT W/ROCK FRAG MOIST - COMPACT

REVISIONS
3-12-71 Spillway Revised & Stilling Basin Added
4-22-71 Dam, Spillway & Lake Drain Revised
5-13-71 Inspection Trench Revised

EMERALD LAKES
TOBYHANNA AND TUNKHANNOCK TWPS.
MONROE COUNTY, PENNSYLVANIA

SITE PLAN
PROPOSED DAM

SCALE 1" = 30'
DATE OCT. 1970

FOGARASI AND MOYER
CONSULTING CIVIL ENGINEERS
ALLENTOWN, PENNSYLVANIA

70-14-02
SHEET 2 OF 4

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

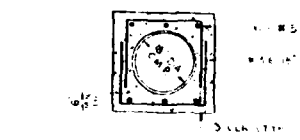
PINETREE LAKE DAM
UNIDEL, INC.

PLAN 2

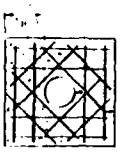
APRIL 1980

PLATE E-3

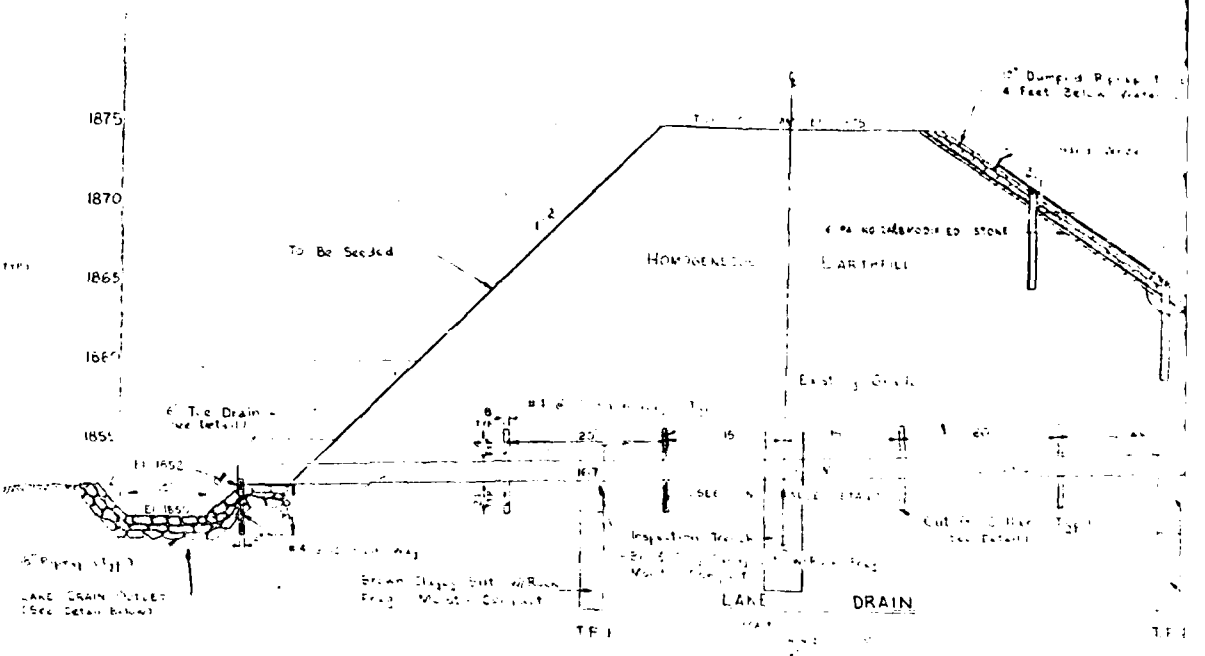
E-3 S - 476

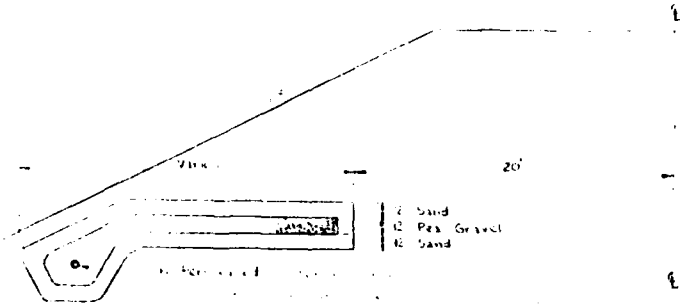


CONCRETE CRADLE



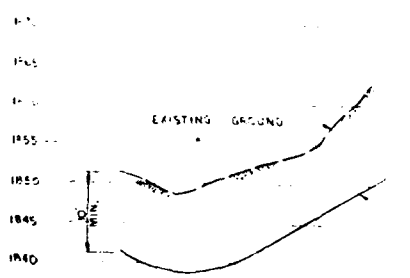
CUT-OFF COLLAR



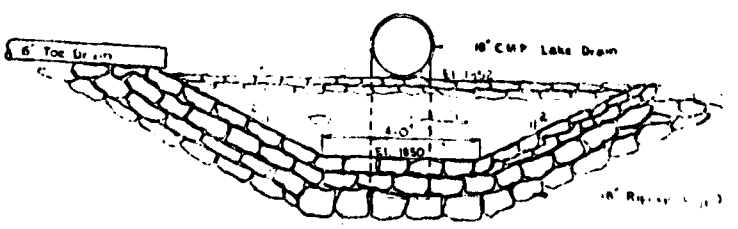


FILTER BLANKET & TOE DRAIN

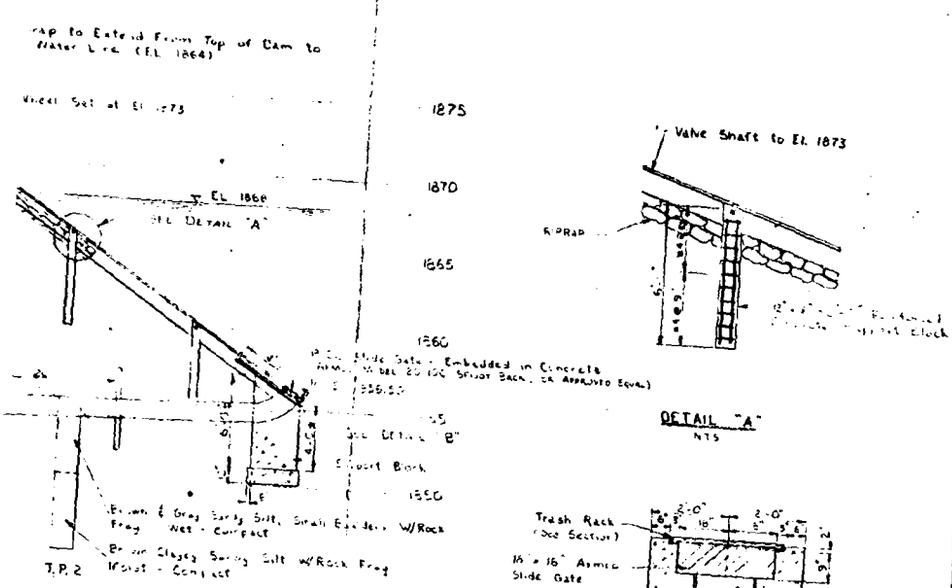
NOTE



INSPECTION



LAKE DRAIN OUTLET



DETAIL "A"
NTS

DETAIL "B"
SCALE 1/2" = 1'-0"

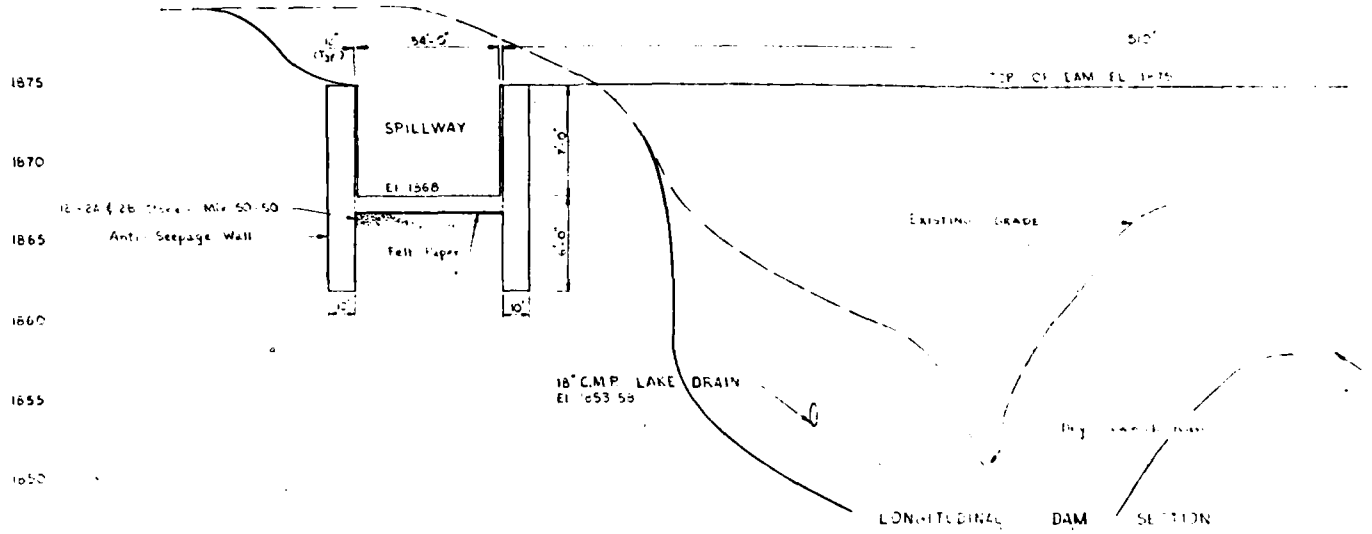
TRASH RACK
SCALE 1/2" = 1'-0"

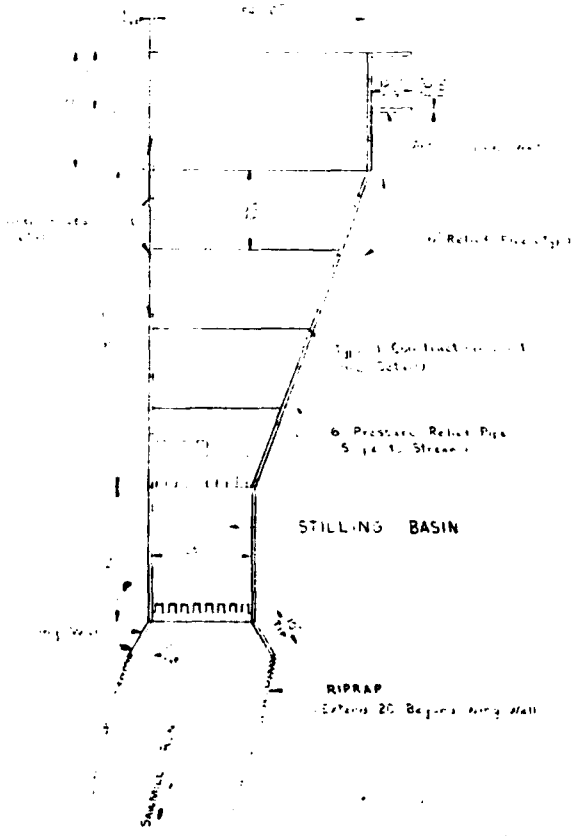
CTION TRENCH DETAIL
SCALE:

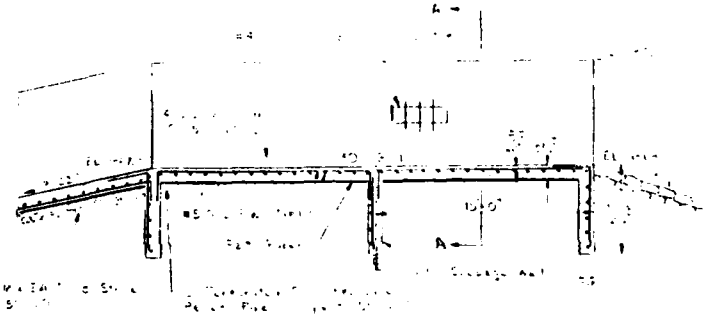
FILE IN OFFICE
RECEIVED IN THE OFFICE OF THE DEPARTMENT OF ENVIRONMENTAL RESOURCES.
ON _____
FILE CLERK

REVISIONS	EMERALD LAKES	
5-4-71 ...	TOBYHANNA AND TUNKHANNOCK TWPS. MONROE COUNTY, PENNSYLVANIA	
	MISCELLANEOUS DETAILS	
	SCALE AS SHOWN	POGARASI AND MOYER CONSULTING CIVIL ENGINEERS ALLENTOWN, PENNSYLVANIA
	DATE OCT. 1970	70-14-02
		SHEET 3 OF 6

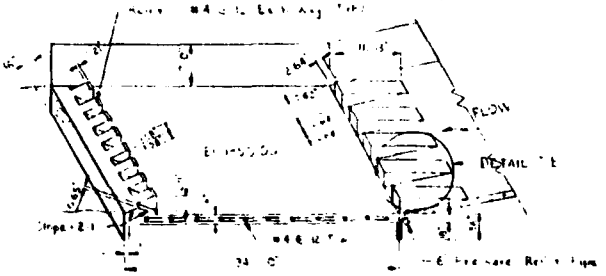
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PINETREE LAKE DAM
UNIDEL, INC.
SECTION AND OUTLET WORKS 2
APRIL 1980 PLATE E-4

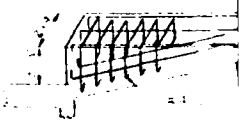

1875
1870
1865
1860
1855
1850
SPILLWAY
EL 1868
Anti Seepage Wall
Felt Paper
18" C.M.P. LAKE DRAIN
EXISTING GRADE
LONGITUDINAL DAM SECTION

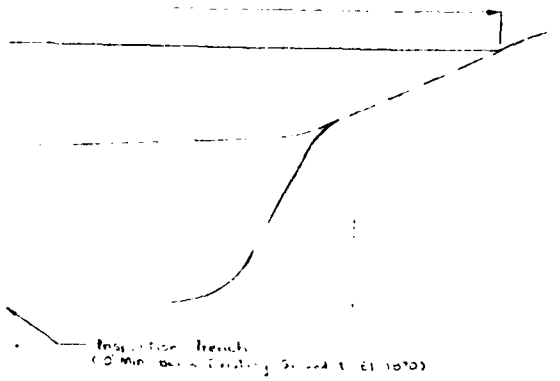

STILLING BASIN
RIPRAP
PLAN

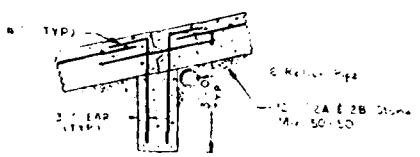

SPILLWAY SECTION


TYP CONST JOINT


FLOW
DETAIL "E"
STILLING BASIN DETAIL

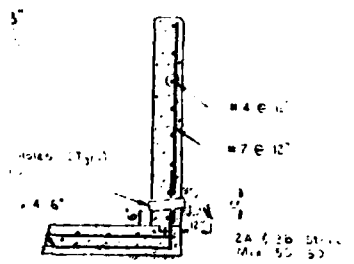

DETAIL "B"





DETAIL "A"

PROFILE



SECTION A-A

GENERAL NOTES

1. Concrete To Have [illegible] Strength of 3000 psi.
2. Reinforcing Bars [illegible] ASTM Gr 60.
3. All Concrete To Be Cured For Five Days Wet By Leaving Forms in Place Covering with Burlap Material or Spray Curing.
4. Concrete Structures [illegible] On All Exposed Edges.
5. All Horizontal Bars To Be Continuous & Around Corners. Minimum Bar Lap 30 Diameters.

REVISIONS
[illegible]

EMERALD LAKES

TOBYHANNA AND TUNKHANNOCK TWPS.
MONROE COUNTY, PENNSYLVANIA

LONGITUDINAL SECTION AND SPILLWAY DETAILS

SCALE AS SHOWN	FOGARASI AND MOYER CONSULTING CIVIL ENGINEERS ALLENTOWN, PENNSYLVANIA	70-14-02
DATE OCT. 1970		SHEET 4 OF 4

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PINETREE LAKE DAM

UNIDEL, INC.

PROFILE AND SPILLWAY

APRIL 1980 2 PLATE E-5

APPENDIX F

GEOLOGY

PINETREE LAKE DAM

APPENDIX F

GEOLOGY

Pinetree Lake Dam is located in Monroe County within the Appalachian Plateau Physiographic Province. The most pronounced topographic feature in the area is Camelback Mountain, which is part of the Pocono Plateau Escarpment. The escarpment has a well-defined southwestward trend from Camelback Mountain, but is irregular between Camelback Mountain and Mt. Pocono, which lies to the north. Streams east of the escarpment drain directly to the Delaware River, while those to the west drain to the Lehigh River.

The Pocono Plateau Section lies to the west of the escarpment. This area is relatively flat, with local relief seldom exceeding 100 feet. The topography has been greatly influenced by continental glaciation. Many features were created by deposition of glacial materials. The entire plateau lacks well-developed drainage.

East of the escarpment is the Glaciated Low Plateaus Section of the province. This area is characterized by pre-glacial erosional topography with locally-thick glacial deposits. Local relief is generally 100 to 300 feet.

Bedrock units of the sections described above are the lithified sediments of offshore marine, marginal marine, deltaic and fluvial environments associated with the Devonian Period. These units include siltstones of the Mahantango Formation, siltstones and shales of the Trimmers Rock Formation, and seven mapped members of the Catskill Formation. These members include sandstones, siltstones, and shales of the Towamensing member; sandstone, siltstone and shale of the Walcksville Member; sandstones, siltstones and shale of the Beaverdam Run Member; sandstone and shale in the Long Run Member; sandstones and conglomerates in the Packerton Member; sandstones and some conglomerates in the Poplar Gap Member; and sandstones and conglomerates in the Duncannon Member.

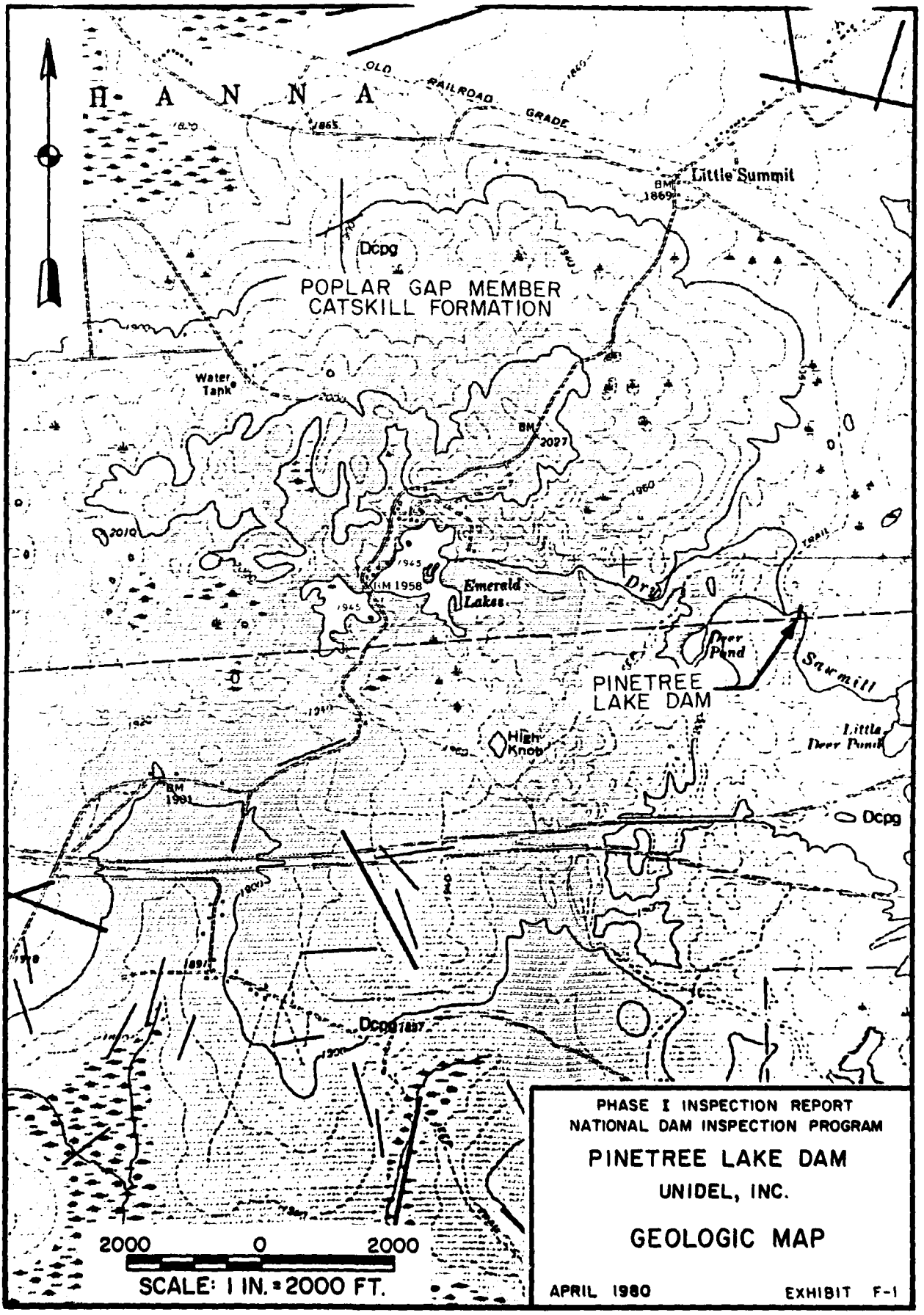
Pinetree Lake Dam is underlain by the Poplar Gap Member of the Catskill Formation. The Poplar Gap Member is predominantly a gray sandstone and conglomeratic sandstone with interbedded siltstones and shales. Sandstones present are thick-bedded, fine- to coarse-grained and exhibit very low primary porosity due to a clay and silica matrix. Effective porosity results from fractures and parting planes.

Conglomeratic sandstone occurs primarily as concentrates of sub-round to round quartz pebbles. The siltstones and shales at the site are thin-bedded and also have low porosity.

The rocks are well-indurated and generally are not susceptible to slope failure; however, the presence of well-developed bedding and joint planes will result in some rockfall from vertical and high-angle cut slopes.

Bedrock is entirely overlain by glacial till of Late Wisconsin Age. This till is an unsorted mixture of clay, silt, sand, and gravel. It is moderately cohesive and is generally derived locally from the sandstones of the Catskill Formation. Thickness of the till varies from 5 to 75 feet.

The available foundation exploration data is shown on Plates E-3 and E-4 in Appendix E. The dam is founded entirely on overburden, which is mostly described as a sandy silt with rock fragments. This silt is a part of the till.


H A N N A
OLD RAILROAD GRADE
Little Summit
BM 1869
Dcpg
POPLAR GAP MEMBER
CATSKILL FORMATION
Water Tank
BM 2027
Emerald Lakes
Deer Pond
PINETREE LAKE DAM
Sawmill
High Knob
Little Deer Pond
BM 1901
Dcpg
Dcpg
2000 0 2000
SCALE: 1 IN. = 2000 FT.
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PINETREE LAKE DAM
UNIDEL, INC.
GEOLOGIC MAP
APRIL 1980
EXHIBIT F-1